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Audubon

WINTER 2024

SEASON OF CHANGE

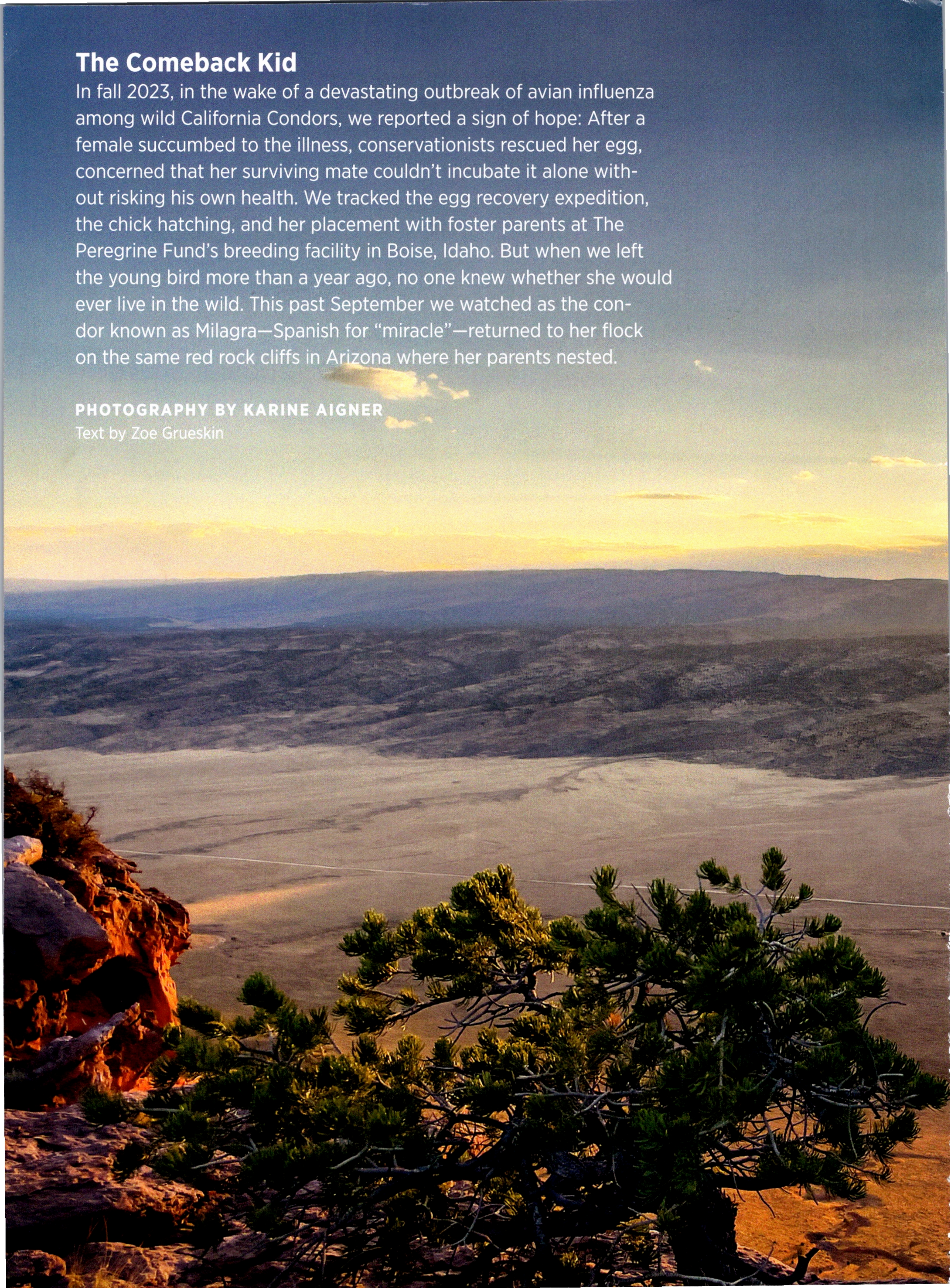
White-tailed Ptarmigan are perfectly adapted to their snow-capped home. What's a cold-weather bird to do in a warming world?

The Comeback Kid

In fall 2023, in the wake of a devastating outbreak of avian influenza among wild California Condors, we reported a sign of hope: After a female succumbed to the illness, conservationists rescued her egg, concerned that her surviving mate couldn't incubate it alone without risking his own health. We tracked the egg recovery expedition, the chick hatching, and her placement with foster parents at The Peregrine Fund's breeding facility in Boise, Idaho. But when we left the young bird more than a year ago, no one knew whether she would ever live in the wild. This past September we watched as the condor known as Milagra—Spanish for "miracle"—returned to her flock on the same red rock cliffs in Arizona where her parents nested.

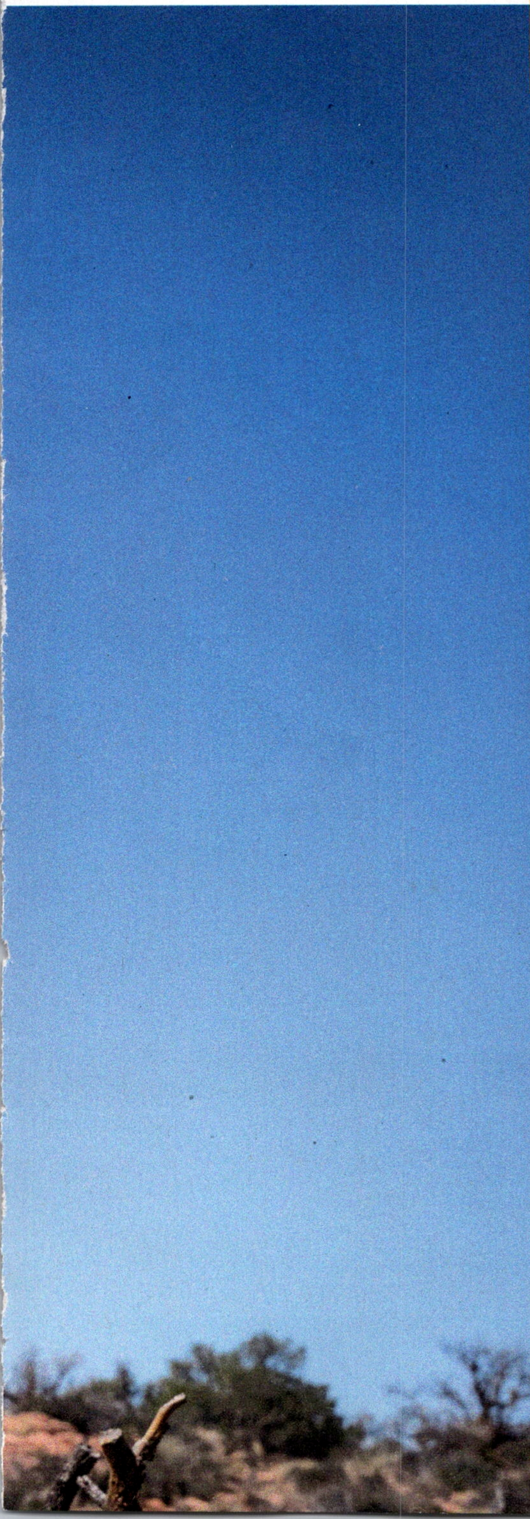
PHOTOGRAPHY BY KARINE AIGNER

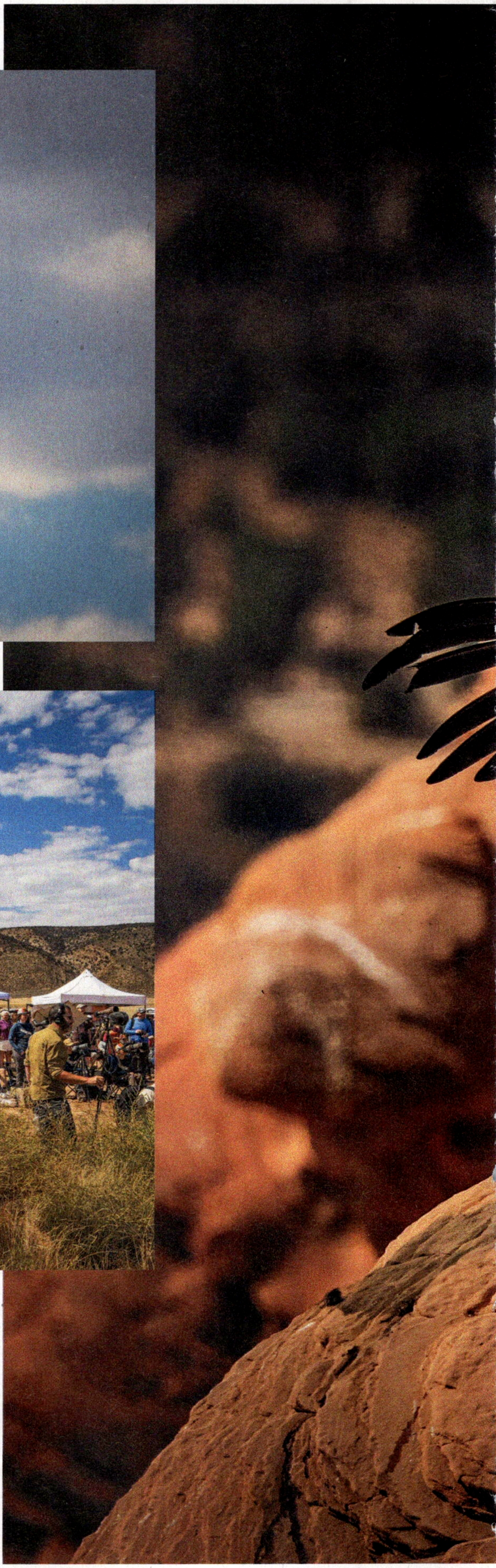
Text by Zoe Grueskin



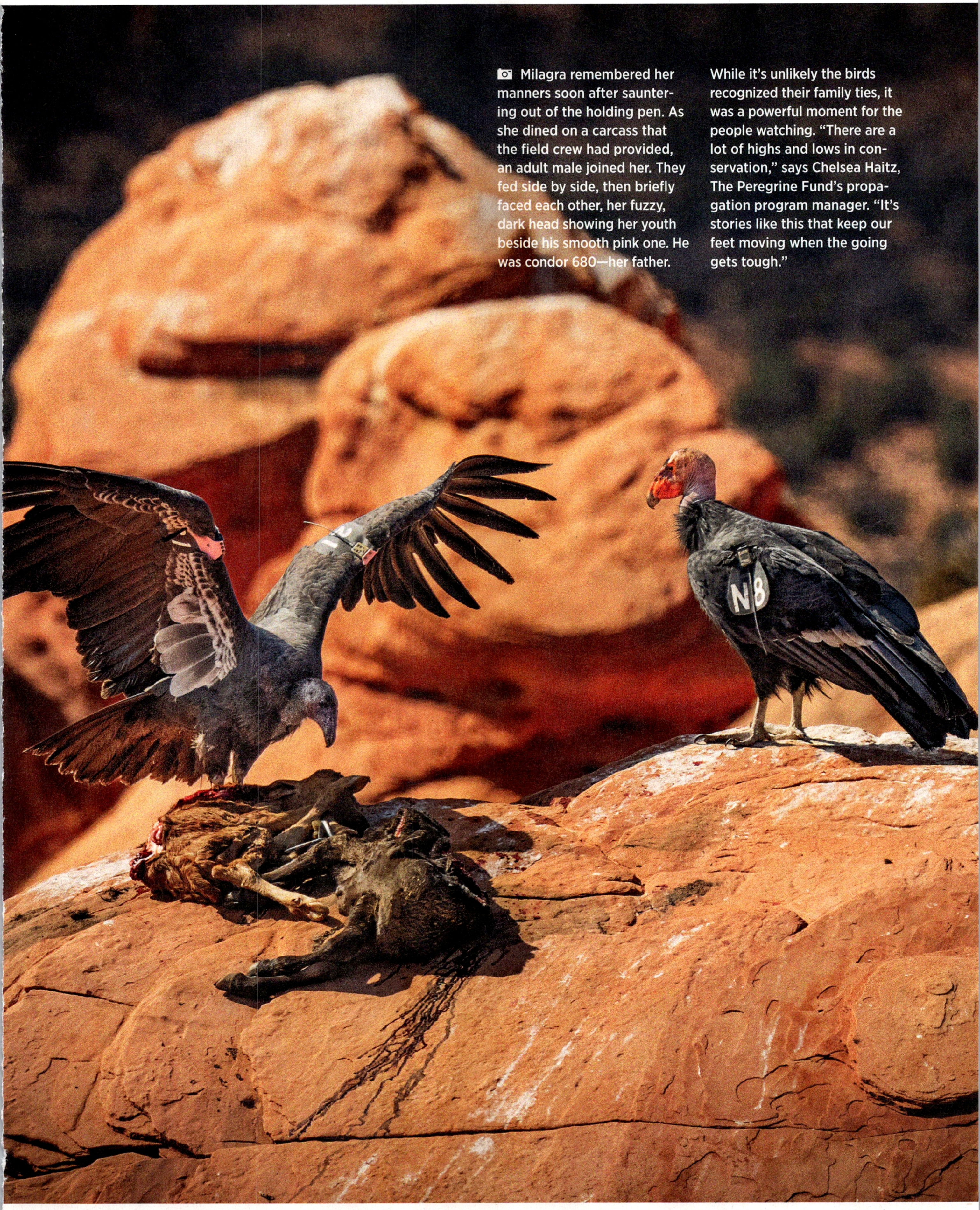
Milagra—officially condor 1221—faced a difficult road back to Vermilion Cliffs National Monument, but she made herself right at home. "By all accounts, Milagra shouldn't have even been there," says Tim Hauck, director of The Peregrine Fund's California Condor program. Hauck helps manage the southwest flock—birds that roost and roam between Zion National Park and the Grand Canyon. The cohort is one of five reestablished wild populations, which together comprise more than 300 birds. Around 200 more condors live in captivity as part of breeding programs that saved the species from extinction. The giant vultures remain endangered, and safeguarding them requires tremendous dedication and coordination among state and federal agencies, nonprofits, and tribal partners.

📷 Clockwise from below: Shawn Farry, The Peregrine Fund's condor program manager, was at the first California Condor release in 1996 and still feels a nervous responsibility when he sets birds free: "Part of your brain is telling you, 'Don't let them out, because that's the best way to keep them alive.'" To help scientists track their movements, every condor carries a radio transmitter and wing tag. Farry and staff from Liberty Wildlife, a rehabilitation center in Phoenix, took an additional step to protect Milagra and three other captive-reared birds being released today by inoculating them against avian flu. Though the virus hasn't been detected in the southwest condors since April 2023, it's still circulating in wildlife around the world. Last winter the flock was hit by a more persistent threat: lead poisoning. The heavy metal, which the scavengers pick up from ammunition fragments in carcasses and gut piles left behind by hunters, is the leading cause of death for condors. It killed a record dozen members of the southwest flock this year, making these young birds' emergence from a temporary pen and into the canyon that much more poignant and important.





Spectators on the valley floor (bottom) watched the towering cliff tops as Milagra spread her wings and took to the air (top). Despite Milagra's exceptional origin story, she's grown up to be a typical condor. Leah Esquivel, The Peregrine Fund's propagation program director, initially worried about Milagra imprinting on people, but that proved to be no problem. Milagra spent her last several months of captivity in a socialization pen with other young condors and two mentor birds, building up her flight muscles and learning proper condor etiquette, like taking turns while feeding.



Milagra remembered her manners soon after sauntering out of the holding pen. As she dined on a carcass that the field crew had provided, an adult male joined her. They fed side by side, then briefly faced each other, her fuzzy, dark head showing her youth beside his smooth pink one. He was condor 680—her father. While it's unlikely the birds recognized their family ties, it was a powerful moment for the people watching. "There are a lot of highs and lows in conservation," says Chelsea Haitz, The Peregrine Fund's propagation program manager. "It's stories like this that keep our feet moving when the going gets tough."

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Climate Elevated Risk

As White-tailed Ptarmigan habitat warms, scientists scour the spine of the Rockies for clues about how to help the birds endure. *By Elizabeth Miller/Photography by Christina M. Selby*

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Community All Together Now

The Christmas Bird Count has grown from just 25 sites in 1900 to more than 2,500 across the hemisphere today. It's poised to welcome more people than ever. *By Rene Ebersole*

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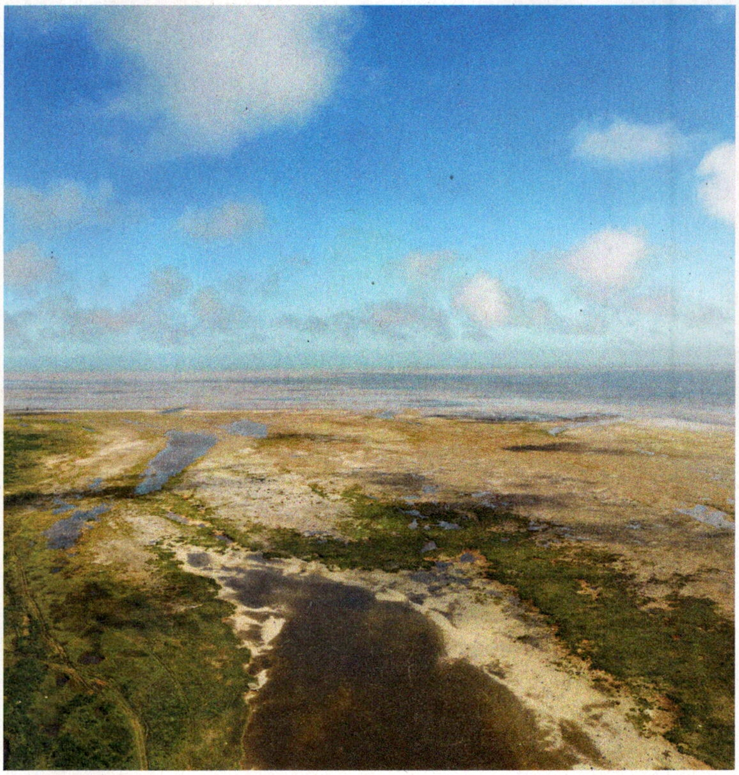
Dispatch Between the Ocean and the Shore

In the face of impending change, Indigenous communities in Canada lead the way to protect a unique ecosystem that people, migratory birds, and other wildlife all rely on. *By Sarah Sax/Photography by Sydney Walsh*



Cover: A White-tailed Ptarmigan's bill, eye, and red eye-comb stand out from its otherwise snow-white camouflage. Photo: Christina M. Selby

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Pursuit You Can't Have Too Many Eagles

Preston Cook's love of the Bald Eagle has led to a collection of 40,000 objects—and a quest to convince people it is more than a potent symbol. *By Jack E. Davis/Photography by Jaida Grey Eagle*

PHOTOS CLOCKWISE FROM TOP RIGHT: SYDNEY WALSH/AUDUBON; JAIDA GREY EAGLE; CAMILLA CEREA/AUDUBON; CHRISTINA M. SELBY.

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David Personius's decoy of a Bar-tailed Godwit offers a contemporary twist on folk art with a complex history.

PHOTOS, CLOCKWISE FROM TOP RIGHT: MIKE FERNANDEZ/AUDUBON; MATTHEW LEAMAN/AUDUBON PHOTOGRAPHY AWARDS; JENN ACKERMAN AND TIM GRUBER; BRIAN KUSHNER/FLICKR

The Long View

Pull back to look at the big picture, and you may glean valuable insights.

BY JENNIFER BOGO, EDITOR-IN-CHIEF

AS WE WERE PREPARING THIS issue, we asked Christmas Bird Count participants for their favorite memories from the annual community science effort. Our inbox soon flooded with birds. There was the "duck-nado," thousands of waterfowl strong. Barred Owls arriving in a moonlit woods with the startling *thwack* of talons on wood. A rare Yellow-breasted Chat seen through the slush. Collected over the count's 125-year history, these anecdotes are more than snapshots in time. As you'll see in "All Together Now" (page 28), they provide an important view into how birds are doing in the long run.

"I wish more people realized the impact that they can make on science by volunteering for just one day out of the year," wrote Ronda DeCaire of Elkhart County, Indiana. "Within my lifetime alone I have seen birds expanding their range in the Midwest, and others in decline. The data that is collected demonstrates what we are witnessing."

Stories throughout this issue show valuable insights can be gained from paying attention to small details, then pulling back to look at the big picture. Amy Seglund finished a six-year study on White-tailed Ptarmigan that suggested the birds were doing fine—only to spot clues soon after that they weren't. So she headed back into the field to gather more data, which are now telling a different tale: one of a species vulnerable to climate change ("Elevated Risk," page 20).

The Indigenous communities in "Between the Ocean and the Shore" (page 34), meanwhile, know from millennia of living in close relationship with the ecosystem of the James and Hudson Bays how sensitive birds and people are to environmental change. As a result, they're advocating for both a marine conservation area and a more expansive vision of protected lands and waters.

When we step back and look through a wider lens, we see other kinds of relationships as well. In a vast collection of Bald Eagle objects ("You Can't Have Too Many Eagles," page 42), we see our complicated history with the bird that symbolizes our nation. In an immense gathering of crows ("Meet the Neighbors," page 48), we see the familiar dynamics of families.

And in the Christmas Bird Count, we see a community drawn together by a shared interest in avian life. The memories that volunteers sent us had equally strong impressions of people: mentors and partners, neighbors and children, friends old and new. In today's sometimes overwhelming world, those relationships are something to count, too.

They provide an important view of how birds are doing in the long run.

The Road Ahead

Audubon unites people across borders and partisan lines to protect birds wherever they are—regardless of the political landscape.

BY ELIZABETH GRAY, PH.D.
CHIEF EXECUTIVE OFFICER

The Red Knot migrates more than 9,000 miles, from as far south as Argentina to the Canadian Arctic.

AS PRESIDENT TRUMP RETURNS to office, we are reminded that while political outcomes shift, Audubon's mission to protect birds and the places they need does not. Whether in the United States or across the hemisphere, our commitment to our mission is unwavering. This election brings a new set of challenges, but it also reaffirms something we have always known: Birds have the power to unite us across borders. In this moment, that unity is critical for driving the conservation and climate action that birds and people everywhere depend upon.

At Audubon, we take pride in our role as a nonpartisan convener across the Americas. While the distinctive hues of the Red Knot and Blue-winged Warbler recall the colors of different political parties in the United States, their migrations remind us that birds move freely across our skies. Likewise, Audubon's membership spans this vast hemisphere, and while our members hold different political views, they are unified by their love of birds and commitment to the natural world. This shared passion allows us to build bridges and find common ground, no matter the political landscape.

> Shared passion allows us to build bridges and find common ground.

Policy is one of the most effective tools for creating lasting change. From local actions to international agreements, science-based policies are key to protecting birds and their habitats. Whether advocating for stronger migratory bird protections in the United States, restoring critical habitats in Central America, or working with Canadian partners to safeguard the boreal forest, our policy efforts are critical to scaling our impact. These solutions are more urgent than ever as we confront the dual crises of climate change and biodiversity loss.

Audubon has weathered political changes for more than a century, adapting through 30 U.S. presidential administrations while staying true to our mission. From the Migratory Bird Treaty Act in 1918 to recent bipartisan victories like the Neotropical Migratory Bird Conservation Act, our history proves that conservation transcends political and geographical boundaries. As we enter this new political chapter, we remain focused on building partnerships that unite diverse stakeholders. Our work will continue, and we are ready to move forward. Whether restoring coastal wetlands or protecting migratory corridors, our success is rooted in collaboration and a shared commitment to safeguarding the natural world.

Challenges and opportunities lie ahead as we ensure that critical policies, such as the U.S. Inflation Reduction Act and international climate agreements, are protected and leveraged effectively. By working together across the hemisphere, Audubon will continue to lead on conservation and climate action, regardless of shifts in political leadership.

With your ongoing support, we will keep working toward our guiding star of bending the bird curve—halting and ultimately reversing the alarming decline of bird populations across the Americas. Together, we will build a future where both birds and people thrive. Ⓐ

PHOTOS FROM TOP: JAIR F. COLL; BRIAN KUSHNER/FLICKR

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ACORN WOODPECKER
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A common eastern bumble bee with American senna.

Busy Bees Down an unmarked road in Maryland's Patuxent Research Refuge sits a government research facility once used for breeding Whooping Cranes. Here, at the U.S. Geological Survey's Native Bee Inventory and Monitoring Lab, scientists spend their days studying the country's roughly 4,000 species of native bees. Key to this work are the acres of surrounding native flowers planted to attract the pollinators—which also draw plenty of birds. More than just a research operation, the lab regularly hosts volunteers and helps partners bring native plants to their own communities. Learn about the lab's work and see some beautiful bee photos at **audubon.org/bees**.

Audubon
A Rare Treat

Send letters to audubonmagazine @audubon.org.

RE: "Disappearing Act"

Our Fall 2024 story exploring the mysterious decline of Common Grackles resonated with readers on Facebook. "I've really noticed this living in eastern Iowa most of my life," commented **AMY DOBRIAN**. "They were all over the place when I was a kid, but for the last 20 years or so, I rarely see them east of Des Moines. I love them, and I'm thrilled when I get to see their shiny heads and intense yellow stare." Reader **SHERRI MICHELLE** has also observed the decrease in grackles. "I've noticed the migration flocks are much smaller in the fields this year," she shared. "After reading the latest write-up in *Audubon*, I'm extremely concerned. These birds are currently dying at an alarming rate. While they may not be everyone's favorite, they still play a vital role in our ecosystem."

RE: "Anguish to Activism"

"It was with sadness that I read about the high proportion of rodenticide poisonings among owls and raptors," wrote reader **DOROTHY LYONS**. "The use of popular and easily available rodenticides as the answer to a rodent problem seems self-defeating—what impact do we have on rodent populations when we kill their predators? Thank you for bringing attention to this issue."

> "I got a special treat with your profile of the delightful Rosemary Mosco."

RE: "What's So Funny 'Bout Geese, Doves, and Pigeon Banding?"

"I read each issue of your magazine cover to cover, and in the Fall 2024 issue I got a special treat with your profile of the delightful Rosemary Mosco," **ELIZABETH KOCH** wrote to us. "I have a copy of *A Pocket Guide to Pigeon Watching*, which I've read at least twice and go back to often. I got the book because I wanted to learn more about these ubiquitous birds—I had no idea what I was in for! It's sweet and funny with great illustrations, and what's more, it's educational. After I read your article, which presented such a great profile of the author, I understood why I enjoy this book so much. Rosemary's love of life and her sense of humor make it a joy."

RE: "Birds of a Feather Vote Together"

"I want to take a moment to tip my hat to Zoe Grueskin for her article in the Fall edition of the magazine titled 'Birds of a Feather Vote Together' for an article well written," wrote **CHRISTOPHER COURY**. "Politics is a touchy subject in this day and age. I found Ms. Grueskin's article to be inspiring without sounding biased towards a particular party. I wholeheartedly agree that a better political system is not based on a particular party, but getting everyone involved and most of all *informed*."

Falling Falcons Peregrine Falcon populations are experiencing a decline not seen since the DDT era, and many experts believe avian flu is to blame. Read more at **audubon.org/peregrines**.

PHOTOS CLOCKWISE FROM TOP LEFT: CHRIS LINDER; LYNNE FALTERBAUER/AUDUBON PHOTOGRAPHY AWARDS; KARINE AIGNER

FIELD NOTES

SURGE

Does Not Compute

How the AI boom threatens to short-circuit climate action.

BY LAUREN LEFFER

NORTHERN VIRGINIA'S DATA Center Alley lives up to its nickname. Vast, windowless buildings proliferate beside suburban neighborhoods, looming over cul-de-sacs. Dwelling among these imposing buildings—warehouses full of servers, the physical embodiment of the online world—feels like "living inside a computer," says Julie Bolthouse, director of land use at the nonprofit Piedmont Environmental Council.

The area has been a hub for digital infrastructure for decades, but recently, development has exploded. In 2016 Loudoun County hosted 8.8 million square feet of data-center floor space. By 2020 that figure had more than doubled, and it has since doubled once again, with yet another doubling on the horizon.

Artificial intelligence is one major reason for the boom. The technology powers all sorts of online experiences, from programs that predict your search query to apps that identify birds. But some experts are especially concerned about the more recent growth of generative AI. These tools, which can write emails, conjure images, and compose music based on a user's prompt, require intense computing power—and vast quantities of electricity. Experts warn that AI's insatiable appetite could derail efforts to ditch fossil fuels and confront climate change. "Decarbonization is at risk," says University of Chicago computer scientist Andrew A. Chien. "Progress is at risk."

Loudoun County epitomizes these tensions. Power demand grew in the county by 340 percent between 2018 and 2023. To feed data centers, the regional grid operator plans to keep running coal plants in West Virginia and Maryland that were previously scheduled for retirement. Dominion Energy is building a natural gas plant 100 miles to the south for the same purpose, despite local opposition.

Generative AI requires tremendous energy because it churns through extraordinarily complex math. Every line of text from a chatbot requires billions of calculations, says Shaolei Ren, associate professor of electrical and computer engineering at the University of California, Riverside. Writing a single email with ChatGPT can use as much energy as driving a two-ton electric vehicle half a mile, Ren says.

"AI is a fundamentally different computing paradigm," Chien says. "It has this sort of limitless potential for growth that means you have to pay extra attention to it." In 2022 data centers accounted for about 4.5 percent of U.S. energy demand. By 2030 that figure could reach 17 percent, due in large part to generative AI, per a Bloomberg analysis.

> AI requires intense computing power—and vast quantities of electricity.

AI supporters say that, with the rise of carbon-free power sources, the technology doesn't have to be an environmental problem. However, in the United States renewable energy production has grown by only about 1 percent per year since 2010, notes Chien. To offset worst-case energy demand forecasts for data centers alone, that rate would suddenly need to more than double.

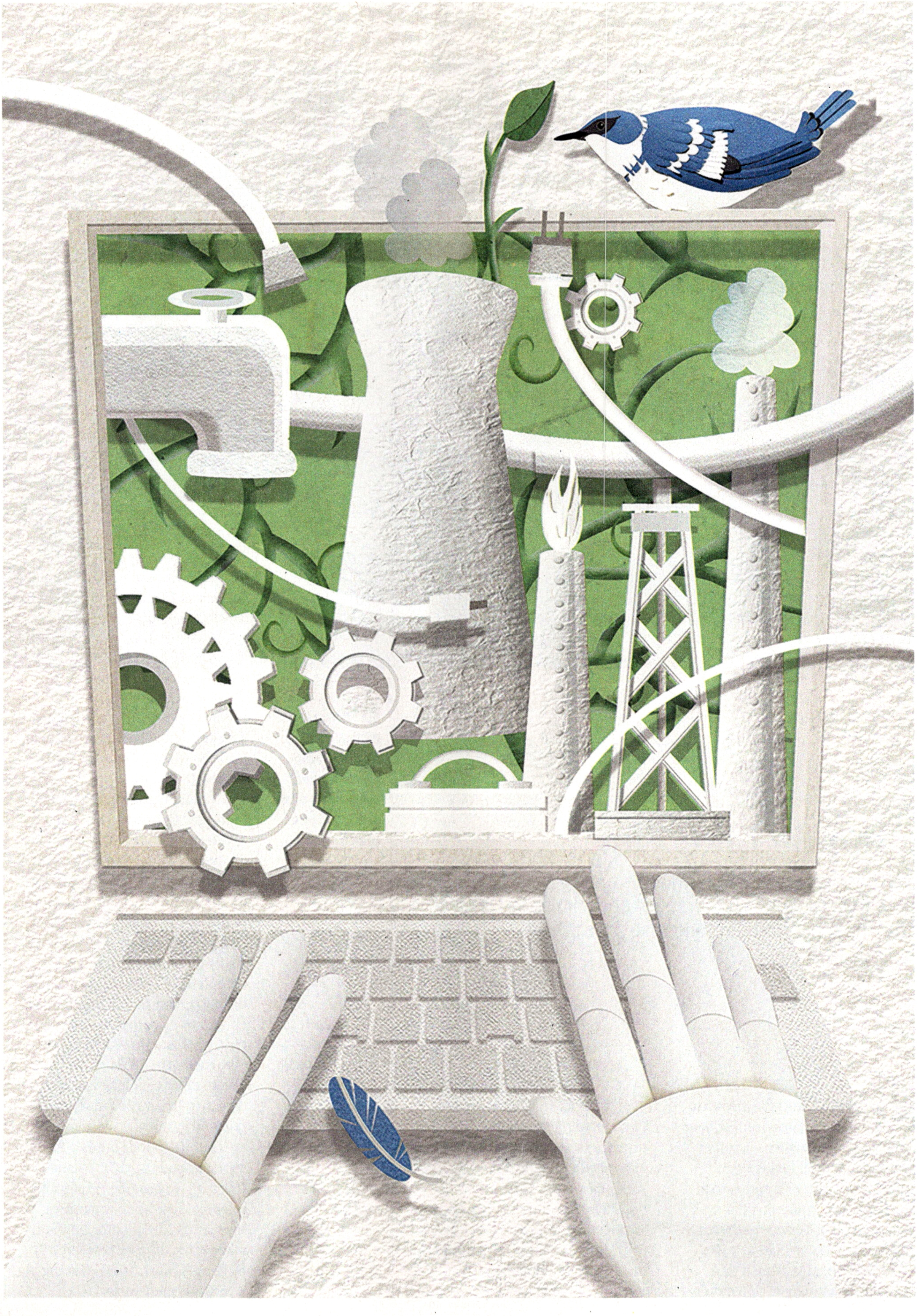
In response, companies are seeking out other sources of carbon-free energy. Constellation Energy and Microsoft are working to reopen the infamous Three Mile Island nuclear plant, with the aid of taxpayer dollars, solely to power data centers. Google plans to rely on small modular nuclear reactors, which have yet to be built. Meanwhile, Microsoft's and Google's embrace of data centers and AI has caused both companies' carbon emissions to spike, according to their 2024 sustainability reports.

To put AI on a more responsible trajectory, regulators should require transparency and corporate accountability, says Priya Donti, an MIT computer scientist and cofounder of the nonprofit Climate Change AI. Loudoun County has moved in that direction, giving the county board more discretion over project approval. Congressional Democrats introduced legislation in 2024 to evaluate AI's environmental impact, which also includes significant water consumption to keep servers from overheating. Running 10 ChatGPT queries requires up to 2 liters of water, Ren estimates.

Some proven solutions could also help, such as building data centers in places with plenty of water and carbon-free energy. Adding energy storage eases strain on the electric grid when the sun isn't out and the wind isn't blowing, and companies can go further by shifting their most energy-intensive tasks to times when there's surplus.

Yet for businesses to adopt sustainability measures, they'll need external prodding: tax breaks for cutting emissions, more oversight on new development, or outright restrictions on when, where, and how data centers can be built. At this stage, all options should be on the table, Ren says. Otherwise, "I'm not hopeful that the tech industry will be able to solve this problem on its own." Ⓐ

ILLUSTRATION BY FELIX SOCKWELL



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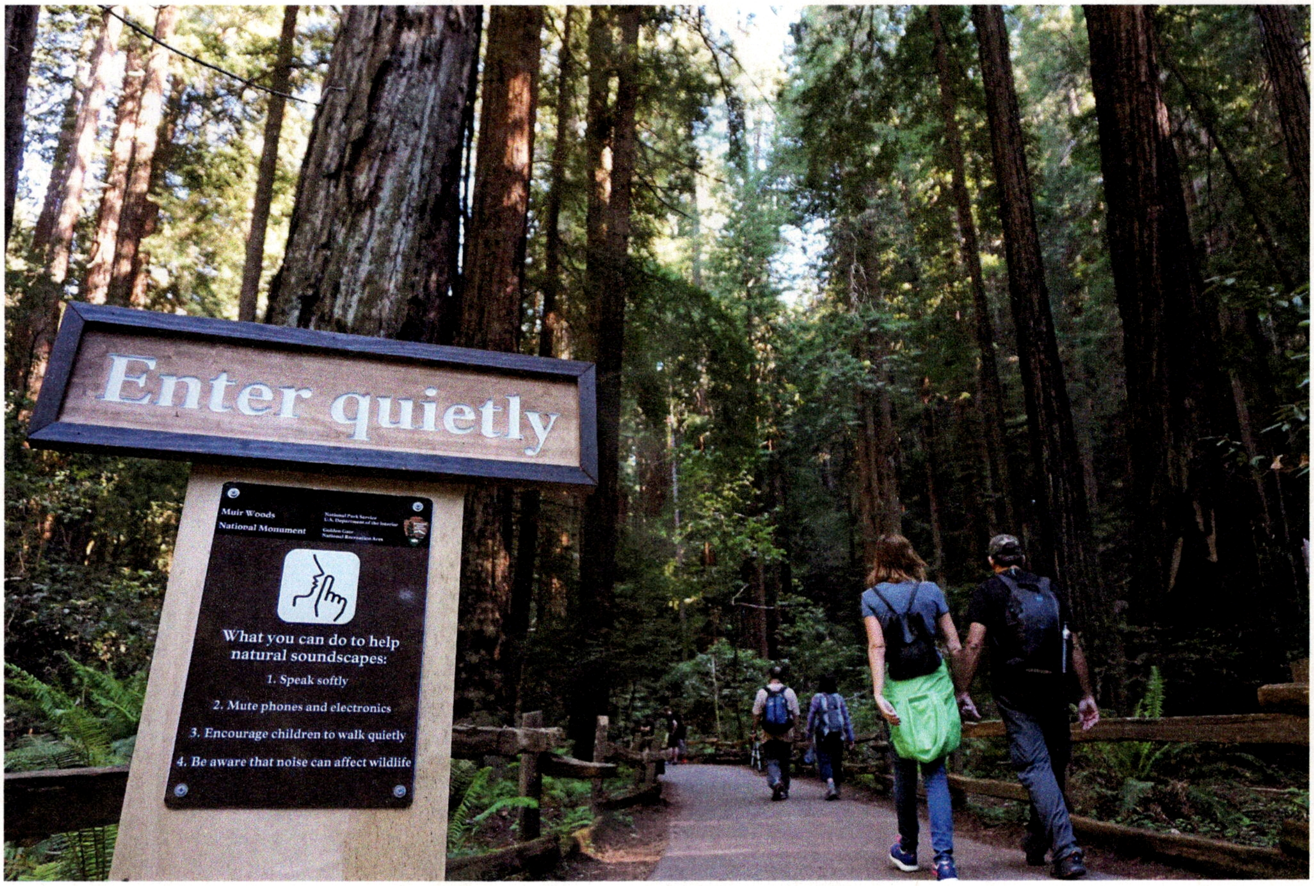

Enter quietly
Muir Woods National Monument
National Park Service U.S. Department of the Interior
Golden Gate National Recreation Area
What you can do to help natural soundscapes:
1. Speak softly
2. Mute phones and electronics
3. Encourage children to walk quietly
4. Be aware that noise can affect wildlife

Visitors to Muir Woods National Monument found more birds when asked to lower their volume.

PHOTOS, ALL COURTESY, FROM LEFT: JESSE BARBER; MITCHELL LEVENHAGEN; QUIET PARKS INTERNATIONAL

Sounds Like Fun

As more people explore the outdoors, researchers aim to understand and minimize the impacts of recreation noise on wildlife.

BY CHRISTINE PETERSON

FOR HIKERS, BIKERS, AND DOG walkers, the proposed Skyline Trail was a no-brainer—another way to clear their heads and enjoy views of the Grand Tetons near Jackson, Wyoming. But as the U.S. Forest Service gathered public input on its plan in 2011, wildlife advocates argued that the fast-developing region didn't need another trail, let alone one that would pulse more people through increasingly rare intact habitat where mule deer calved and American Goshawks nested.

The supporters ultimately prevailed, but the debate wasn't over or confined to Jackson. Around the country, land management agencies are building more trails for a public that wants to get outside. The pandemic sent more people into the woods: National forests hosted 18 million more visits in 2020 than in 2019, a 12 percent increase. Visitation has remained above pre-pandemic levels since.

Trail running and backcountry skiing may leave a smaller mark on the landscape than, say, mining or drilling, but such activities still impact wildlife. In 2016—a year before the Skyline Trail was completed—scientists surveyed the existing research and found abundant evidence that outdoor recreation can have a negative influence on wild animals. The most severe effects include less species diversity, lower reproduction, and reduced survival.

That has public lands officials trying to find the right balance. "How do we provide great trail systems close to communities," says Linda Merigliano, recreation planner for the Bridger-Teton National Forest, "while leaving big wild areas undisturbed?"

To help answer that question, the Forest Service and conservation groups in 2020 launched the Jackson Hole Recreation-Wildlife Co-Existence Project, a research effort across northwest Wyoming. Its aim is to better understand where, when, and how fun-seeking humans encroach on wild animals that are trying to find mates or keep themselves and their offspring fed—and then minimize disturbance. Some of the project's most recent work seeks to understand a particularly pesky form of intrusion: sound.

Not surprisingly, previous research had demonstrated that the din of roaring tourist aircraft and whining snowmobiles changes how wildlife behave. But studies also show that people driving ordinary vehicles down highways to a favorite trailhead or fishing hole are enough to cause a disturbance. For a 2015 study, researchers played the recorded sounds of automobile traffic in a roadless area of Idaho where many birds stop to feed during fall migration. Avian abundance dropped by 25 percent.

"The animals are using sounds of humans to avoid the area," says Jesse Barber, curator of conservation science at the American Museum of Natural History and an author of that study. "It's adding information to the landscape, and the information is, 'There's people there and I don't want to be by them.'" Among those birds that stuck around despite the noise, MacGillivray's Warblers and other species were so stressed out by this "phantom road" that they had trouble gaining the weight needed to continue their southward journeys.

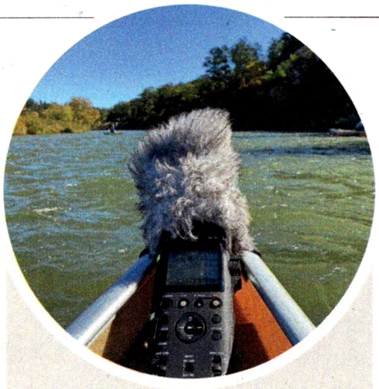
Recording units capture sound in Muir Woods (below) and on the Niobrara River (above).

In Wyoming, wildlife biologists Mark Ditmer and Kathy Zeller with the Forest Service's Rocky Mountain Research Station decided to go further and study whether animals react similarly to the sounds of trail users. They played audio of mountain bikes and chatty hikers from speakers and, using trail cameras, observed how wildlife reacted. Their 2024 paper reported that mammals such as elk, pronghorn, and black bears were far more likely to flee from those human sounds than from natural ones. Now the pair are studying how birds respond to the same noises, this time by recording avian vocalizations and identifying changes in the soundscape.

The results won't be clear for months, but they could eventually help convince outdoors enthusiasts to accept some restrictions that minimize disturbance from their favorite pastimes. "We need to make sure, for those species that remain, we're doing it right—that the habitat isn't getting degraded in ways we haven't thought about before," Ditmer says. In Jackson, the Forest Service closes the Skyline Trail for portions of spring to benefit nesting birds and calving deer. While some locals have protested, most people understand that humans need to give up a little to help wildlife, Merigliano says.

Experts agree that the best way forward will involve compromises, not kicking people out of the woods. On top of its physical and mental health benefits, going outside may also encourage people to use their dollars, votes, or voices to support wildlife. A 2020 study showed that when Barber posted signs at Muir Woods National Monument in California asking people to remain quiet, visitors reported finding more birds. In follow-up surveys, they said they would be more likely to support conservation measures.

Smarter management of wildlife habitat starts with acknowledging a truth that is becoming increasingly evident, Barber says: "When you build a trail, you change a place." Ⓐ



Silence, Please

STOP AND LISTEN ALONG the Niobrara National Scenic River in Nebraska and you might tune in to trickling waterfalls, croaking bullfrogs, or calling Green Herons. "It's exploding with wildlife," says park superintendent Susan Cook.

What you're unlikely to hear is noise from cars, airplanes, and recreational vehicles, says Nick McMahan, director of quiet trails for Quiet Parks International. Based on observations he and his colleagues made while paddling the river, in late 2023 the nonprofit declared the route its first quiet trail in the United States—one of several awards it offers to spotlight sanctuaries from the world's motorized din.

Just as wildlife thrive in quieter environments, so do people. But finding calming places is increasingly difficult. Nearly all U.S. residents hear some aviation, rail, or road noise in their daily lives, according to federal data, and almost one-third live in areas exposed to traffic noise above 45 decibels. In some popular recreation areas, tourist helicopters, ATVs, and snowmobiles add to the clamor.

Since 2019, Quiet Parks International has worked to develop standards for what exactly constitutes "quiet" in a range of environments, from remote wilderness to urban parks. The goal? To help land managers promote, value, and preserve places where visitors can commune with nature's sounds, even for a short while. *—Jessica Leber*

The Green Gap

When it comes to wildlife, not all neighborhoods are created equal; they're defined by injustices past and present.

BY MADDIE BURAKOFF

ON A CLOUDY SEPTEMBER morning in Prospect Park, a massive swath of greenery amid Brooklyn's concrete sprawl, the fall migrants are flying fast and furious. A group of birders spin excitedly in a clearing, calling out as new species appear. "What a hotspot," says Valentina Alaasam as she scribbles down each name in rapid succession: American Redstart, Scarlet Tanager, Black-and-white Warbler.

Alaasam will add the morning's counts to a biodiversity database that she and her colleagues at New York University have been compiling for more than a year. The goal: to figure out whether parks in richer areas are also richer in wildlife. "I've always been really interested in this concept of luxury effects, where neighborhoods that are wealthier tend to get more investment from the city, and more trees, and more green spaces," Alaasam says. To test how that may play out in New York, the team has been counting birds, bugs, frogs, and more across 11 city parks, including relatively well-maintained oases like Prospect Park and others that receive less upkeep.

The project will add to a growing body of research that's revealing how economic and racial inequities shape urban ecosystems. In many cities, money has proven to be a major ecological boon: Wealthier neighborhoods host more of the street trees and park spaces that attract wildlife, while poorer areas have more uninterrupted concrete, leaving residents less likely to spot a flitting vireo or loping coyote. Yet such disparities didn't pop up overnight, and in recent years, scientists have been peeling back the deeper layers that create these patchworks. "The injustices that have shaped what we are today—as a nation, as a society—are shaping the entirety of the planet," says Christopher Schell, an urban ecologist at the University of California, Berkeley.

In 2020 Schell and his coauthors published an influential study suggesting that biodiversity in cities was strongly tied to systemic racism. In particular, they argued, discriminatory federal housing policies known as redlining, though long abandoned, still shape local ecology today. Starting in the 1930s, federal housing agencies graded neighborhoods to inform whether banks should offer loans there—and assigned lower grades to places where racial minorities lived. Residents in these areas, which were delineated in red ink to mark them as "hazardous,"

Front, from right: NYU researchers Rafael Baez, Emerald Lin, and Valentina Alaasam collect data with birders in Prospect Park.

PHOTOGRAPH BY SYDNEY WALSH/AUDUBON

were then less likely to receive mortgages or local funding and more likely to watch their neighborhoods get torn up by highways or saddled with toxic pollution.

Though the practice was outlawed in 1968, that legacy of segregation and disinvestment still echoes through American cities. "They're no longer graded," says Chloé Schmidt, an evolutionary ecologist at the German Centre for Integrative Biodiversity Research who has researched the effects of U.S. redlining. "But those environmental differences persist." Studies across multiple cities have found that areas deemed most desirable on the color-coded maps are greener today: They have nearly twice as much tree cover as redlined areas and are home to a higher diversity of animal species. Bird surveys in Los Angeles have shown that forest birds such as warblers flock to more affluent areas, while historically redlined communities mainly host classic urban dwellers like pigeons and sparrows. Meanwhile, Schmidt's work has found that animal populations in minority neighborhoods have lower genetic diversity, suggesting they've been fragmented by barriers like highways and may have more trouble adapting to environmental change.

Still, the patterns around wealth, segregation, and nature are not always simple, says Diego Ellis Soto, a conservation research fellow at UC Berkeley. His work has found that redlined areas tend to have far fewer bird observations in crowdsourced databases like eBird and iNaturalist. Scientists often use those tools to estimate biodiversity, so it's possible they are overlooking species-rich hotspots. "In some of these redlined neighborhoods, we have so little data that we can't even talk about what lives there," he says.

Plus, the manicured habitats typical of areas deemed more desirable on old housing maps may even be less inviting for certain species, says Rafael Baez, a biology graduate student who is helping lead the New York project. Prospect Park is great for birds, but it's Highbridge Park in Manhattan's Washington Heights—a stretch of green along the largely Hispanic neighborhood, where Baez often finds park entrances blocked off and forest floor left untended—that offers the rich layers of leaf litter and rotting logs that salamanders love.

Reckoning with our unequal history will be crucial to solving the biodiversity crisis.

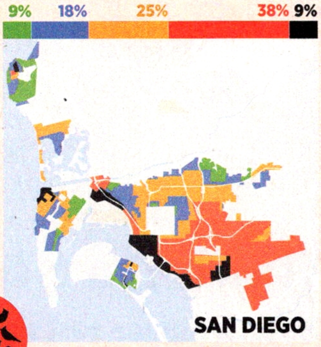
As the team teases out these threads, Baez and Alaasam hope their findings can help inform park management and conservation efforts in New York, whether it's developing green spaces in areas that haven't gotten their fair share or recognizing and protecting rich habitats that have flown under the radar. In cities around the country, reckoning with our unequal history will be crucial to solving the biodiversity crisis and building a better path forward for people and animals alike, scientists say. "We can't just sweep everything under the rug," Schell says. We've got to face our past if we want to have a future." Ⓐ

REDLINING'S LEGACY

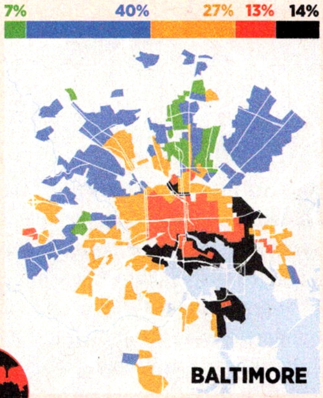
In the mid-20th century the federal government created maps of more than 200 U.S. cities that leaned on racial bias to grade neighborhoods and guide investment. Now studies are revealing how these color-coded borders still shape urban ecosystems.

HISTORICAL GRADE

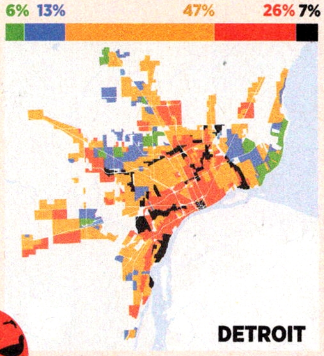
🟩 BEST
🟦 STILL DESIRABLE
🟧 DEFINITELY DECLINING
🟥 HAZARDOUS
⬛ INDUSTRIAL AND COMMERCIAL
🟩🟦🟧🟥⬛ % GRADED



LESS WILDLIFE In California, redlined neighborhoods in San Diego and other cities have lower biodiversity among birds, insects, and mammals, a 2024 study found.



FEWER TREES Redlined areas have only around half as much tree canopy as do the highest-graded areas on federal housing maps, per a 2021 study of 37 cities, including Baltimore.



WEAKER DATA Scientists have far less information on bird diversity in redlined districts of Detroit and other cities—a growing disparity that could hurt conservation and perpetuate inequality, according to a 2023 study.

DATA: NELSON, R. K., WINLING, L., ET AL. (2023). MAPPING INEQUALITY: REDLINING IN NEW DEAL AMERICA. DIGITAL SCHOLARSHIP LAB.

GRAPHICS BY JULIE ROSSMAN/AUDUBON

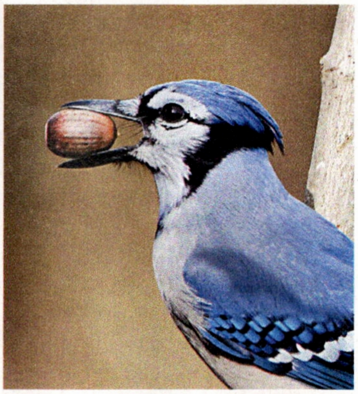
Making a Stand

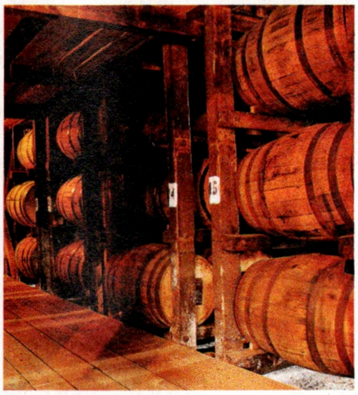
The future of the East's most important tree is in jeopardy. Wildlife groups and whiskey makers are rallying to save it.

BY KATE MORGAN

> Losing white oaks would topple a pillar of eastern ecosystems.

REACHING UP TO 100 FEET TALL, white oak is a dominant species in eastern forests and a prized source of durable timber. But while white oaks are abundant today, experts are sounding alarms about their future. There aren't enough young trees to replace old ones, says Jason Meyer, executive director of the White Oak Initiative, which formed in 2017 to stave off what some see as a major threat. Eastern forest canopies have grown denser over the past century due to fire suppression and reduced logging, and shade-tolerant trees are now outcompeting oaks. Meyer estimates populations will start to decline in the next 10 to 15 years. “If you're looking up, you're seeing plenty of white oak trees,” he says. “If you're not looking down, you're not seeing the problem.”





White oaks provide acorns that Blue Jays and other wildlife covet and wood that's ideal for aging bourbon.

Losing white oaks would topple a pillar of eastern ecosystems. They are the preferred nesting tree for Cerulean Warblers. Their acorns are a key food for Blue Jays, woodpeckers, and especially Wild Turkeys. They host more moth and butterfly larvae than almost any other plant, and these “big, juicy caterpillars” are an important food for forest bird nestlings, says Audubon Connecticut and New York forest manager Suzanne Treyger.

White oak is essential not just for sustaining Wild Turkeys, but also for producing brands like Wild Turkey: By law, bourbons and Tennessee whiskeys must be aged in new oak barrels, whose natural sugars make alcohol look and taste like whiskey. “White oak is the number one ingredient,” says Barbara Hurt, executive director of Dendrifund, a nonprofit affiliated with distillery giant Brown-Forman and a founding member of the White Oak Initiative.

Forestalling a decline requires action now, the initiative argues. Its 2021 action plan helped bring about the Congressional White Oak Caucus, whose members introduced a bill to funnel money into research and regeneration projects. The House passed the bill in September and sent it to the Senate.

Government foresters have already gotten to work, including through logging and prescribed burn projects that create nutrient-rich soil and allow in sunlight to help seedlings germinate.

Yet not everyone thinks such interventions are necessary. White oaks may simply be undergoing a lull in their 100-year regeneration cycle, says Harvard ecologist Neil Pederson: “If there aren't any trees in the understory today, it doesn't mean there's a problem next decade.”

All agree that healthy oaks, like barrels of bourbon, need time to mature. But a wait-and-see approach is risky for those who depend on the species. To protect businesses and birds, white oak advocates say, there's no time like the present.

PHOTOS CLOCKWISE FROM LEFT: DOUGLAS W. TALLAMY (2); JAMES KIRKIKIS/SHUTTERSTOCK

Mikhale Maier (right) and his father, Matt, use wire to limit which pastures cattle can access in their rotational grazing system.

PHOTO: ELLEN SCHMIDT

Cash for Birds

Audubon and partners test a new incentive for growing grasslands in the Midwest.

BY JASPER DAVIDOFF

MATT MAIER WAS HAPPY TO leave behind the constant chores of a family farm to study business, not agriculture, in college. But a couple of decades later, when Maier had children of his own, a dream of raising them on the land took root. So he bought 120 acres of degraded land beside his parents' Minnesota parcel and, in 2003, began grazing cattle.

Since he'd left, however, "things had changed quite dramatically," he says. Other small livestock farms were gone, replaced by corn and soy. The fireflies Maier remembered bottling on summer nights had vanished.

So it goes across the heartland. In the United States and Canada, growers plow up around 2 million acres of prairie each year to plant row crops. Birds have vanished, too. With less nesting habitat, grassland species have suffered the steepest declines among North American birds.

The vast majority of remaining prairie is privately owned. To save it, a variety of conservation programs aim to support livestock producers whose grazing practices reinvigorate ecosystems. "We really want to help these ranchers stay on the land," says Maggi Sliwinski, a rangeland ecologist who works with ranchers in Canada. "They're the ones keeping the grasslands grass."

> "We really want to help these ranchers stay on the land."

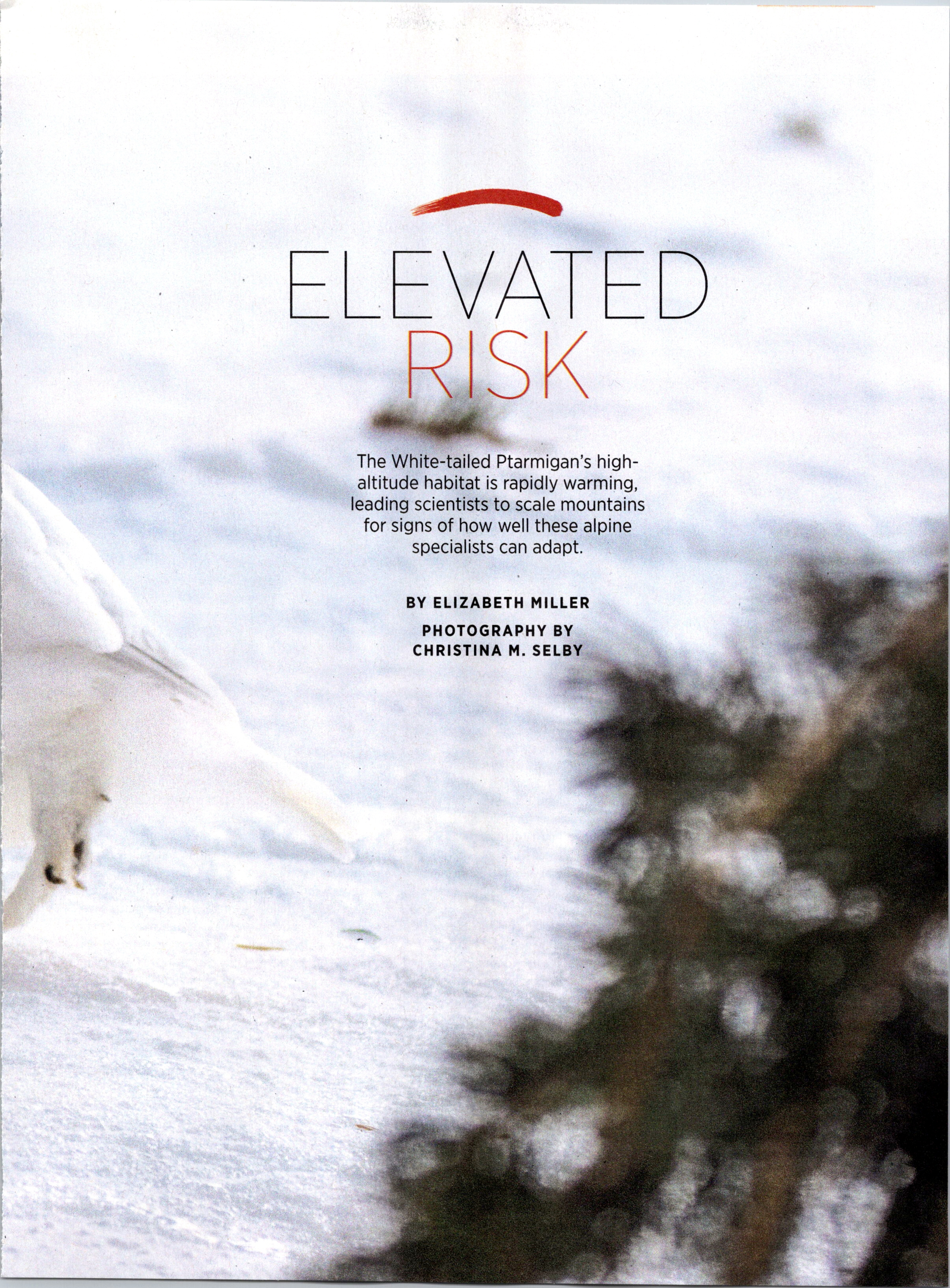
Since 2017 Audubon's Conservation Ranching program has zeroed in on livestock as a lifeline to birds across some 2.8 million acres and counting. Participants who manage habitat in bird-friendly fashion can earn a seal that helps market their products to consumers. Dave Haubein, whose Missouri operation was the first to be certified, says regenerative grazing also yields richer beef from healthier animals. "It's transformed this ranch," he says.

The program's newest phase, funded by a $2.5 million USDA grant, aims to spread those benefits. Dubbed Grazing the Bar, the five-year pilot project offers Midwest farmers an enticing incentive: cold, hard cash if Audubon scientists find Grasshopper Sparrows, Upland Sandpipers, or other priority species on their property. Audubon will also cut checks for producers who adopt USDA conservation practices such as prescribed burning. The co-op Organic Valley, meanwhile, will help gauge the bird-friendliness of organic, grass-fed dairies.

The partners will see which strategies create the biggest impact, then expand them to more states. Their hope is to enable farmers to let grass grow on land that could otherwise generate more lucrative crops. "We're in this mindset with American agriculture that every acre counts," says rancher and Audubon grassland ecologist Ashly Steinke.

In Minnesota, the 1,000 acres Maier has restored now teem with grassland birds, he says, and his farm is on track for Audubon certification by the end of 2024. As he sees it, reviving the prairie is an opportunity to honor his parents. "Everyone said they were crazy for buying this land because it wasn't very suited for grain production," he says. "A generation later, it's perfect for grazing. And for wildlife. And for rebuilding."

With plumage that turns white in winter and densely feathered feet that act like snowshoes, White-tailed Ptarmigan are ideally suited to snowy conditions.



ELEVATED RISK

The White-tailed Ptarmigan's high-altitude habitat is rapidly warming, leading scientists to scale mountains for signs of how well these alpine specialists can adapt.

BY ELIZABETH MILLER

PHOTOGRAPHY BY CHRISTINA M. SELBY

In Colorado's Rocky Mountains, Amy Seglund (opposite, center) and her crews play calls from a speaker to attract ptarmigan, whose earth-tone summer plumage makes them difficult to spot.

THE DARK PROFILES OF THE ROCKY Mountains loom against a star-studded sky. Amy Seglund, a species conservation program manager for Colorado Parks and Wildlife, hikes up a steep trail inlaid with rocks stacked like stairs into a high-elevation basin. As she climbs, her headlamp beam falls on smaller and smaller pines and spruces, then willow thickets, and eventually clumped grasses and plants with leaves and petals smaller than buttons.

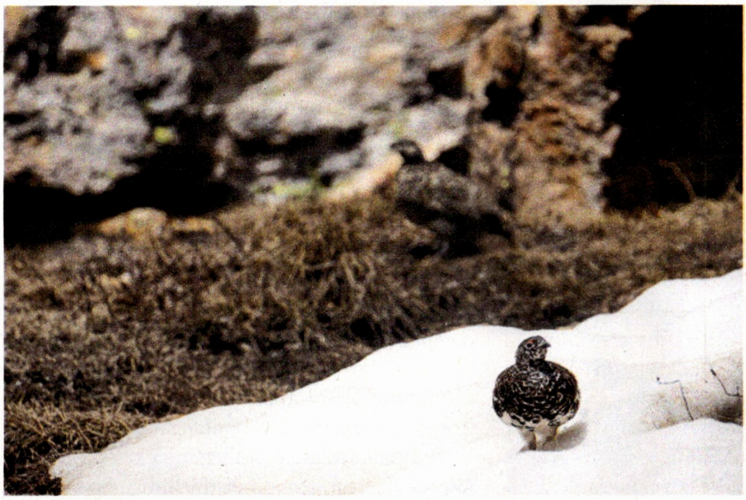
In the dim blue light of dawn, Seglund strides onto the alpine tundra, holds up a boombox-like machine, and blasts the raucous, chattering cry of a male Southern White-tailed Ptarmigan. The birds are masters of camouflage—finding one just by looking is unlikely to impossible—so scientists use this device to call them in. During breeding season, males of this grouse species will rush out at that call, ready to defend their mates. With breeding season over by this late August morning in 2023, some birds may no longer bother, making them hard to spot. But finding ptarmigan here at all is becoming less reliable.

Temperatures historically remained cool in these mountain basins. Snow lingered late into summer, and frequent rainstorms replenished streams and wetlands. Now the alpine zone is growing warmer, and familiar patterns of snow and rain are fragmenting. Seglund is among those trying to find out just how well ptarmigan can adapt to these changes.

Between territorial calls, Seglund plays a chick's piteous cheeping, trying to draw out females. She switches off the device and listens, but only silence follows. Nearly two hours pass before Seglund receives a reply. She looks up to glimpse the white underside of a male ptarmigan flying down from a ridgeline. Then five more birds dash by. Researchers began studying ptarmigan in this basin in the 1960s, so it was one of the first places she started surveying more than a decade ago, when biologists became worried about how the birds would fare in a warming world. Males and females without chicks form flocks in late summer, and initially, Seglund sometimes encountered groups of around 30. Historic literature suggests sizable flocks were common. But in autumn 2021, she found only a handful of birds.

Lower numbers aren't her only concern. She's also seen males—typically vocal about their territories but not physically aggressive—charging and knocking one another off rocks. The squabbles might be linked to a widening gap Seglund has observed between numbers of males and females, which is leaving more males without a mate. Such a

Eventually ptarmigan could lose their high-peak homes altogether.



disparity, she says, “is usually an indication things aren’t going well for a bird.”

To find out for certain, since 2011 field researchers have monitored ptarmigan in Colorado’s high country most summers. Meanwhile, biologists in New Mexico are tracking ptarmigan at the southernmost portion of their range, where the birds are more exposed to the climate-driven challenges creeping north up the spine of the Rockies. The efforts aim to better understand the limits ptarmigan might soon be up against and what, if anything, humans can do to help them survive.

WHITE-TAILED PTARMIGAN WERE BUILT for a wintry world. Their densely feathered feet act like tiny snowshoes. Thick plumage insulates the birds in fierce cold and deep snow. Those feathers molt from mottled chocolate, caramel, and cream in summer to white in winter, matching the landscape so well that ptarmigan can hide in plain sight—their primary defense against predators including weasels, foxes, and raptors. The same goes for Willow and Rock Ptarmigan, which are found at lower elevations than their White-tailed cousins and occupy a vast Arctic and subarctic terrain. The three species constitute the only genus of bird to turn white seasonally.

Through winter they burrow into snowbanks, feeding on willow buds and twigs and gaining weight in a season when most animals struggle not to lose it. But so much insulation makes overheating easy: At just over 70 degrees Fahrenheit, ptarmigan have been seen cooling themselves in snowbanks.

The bulk of White-tailed Ptarmigan habitat is found in western Canada and southeastern Alaska and reaches down into Montana and Washington. But the southern subspecies persists in the high country through Colorado, New Mexico, and historically Wyoming. They may have evolved from ptarmigan that moved south with glaciers during an ice age, then became isolated in colder, wetter conditions above 11,000 feet as the glaciers retreated.

Those conditions are changing rapidly. Alpine habitats—wind-scoured heights where brief growing seasons deter trees and wildflowers hug the ground—are among the fastest-warming on the planet. Average annual temperature in Colorado’s Rocky Mountain National Park has risen 3.4 degrees Fahrenheit over the past century. Snow is melting faster, summers are growing longer, and water sources are drying up. Even as far north as the southern Yukon, the species and its alpine strongholds are suffering from climate change.

Mountaintops are essentially islands of one type of habitat surrounded by an ocean of something else, says David Luther, an ecologist at George Mason University. That isolation puts creatures that live there at greater risk from diseases, predators, and storms. And now, not unlike seas rising to swallow coastal habitat, higher temperatures are pushing the tree line further up mountainsides, shrinking the zone with suitable conditions for the birds. Eventually ptarmigan could lose their high-peak homes altogether—unless they can find strongholds, such as cooler north-facing slopes, and hang on. “That’s the big hope: that animals will have opportunities to go to those microclimate refugia and persist at least long enough to be able to adapt to the new circumstances,” Luther says. “We can’t just cluster them all in the coldest place we can find.”

As early as 2006, researchers flagged climate change as the greatest threat to ptarmigan in the Rockies. In 2010 the nonprofit Center for Biological Diversity detailed those concerns in a petition for the U.S. Fish and Wildlife Service to consider them for threatened or endangered status. Colorado holds the largest Southern White-tailed Ptarmigan population and the greatest share of suitable habitat in the Lower 48, so the FWS asked state wildlife biologists, including Seglund, how the birds were doing.

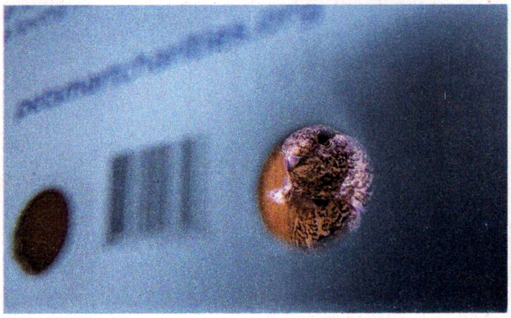
The hope is that the new arrivals will form a self-sustaining population.

Beginning in 2011 she and her team counted ptarmigan, banded more than 600, and radio-collared 126 individuals across the state. Their report, finalized in 2018, generally found the population stable and well dispersed. Soon after, the FWS likewise concluded Southern White-tailed Ptarmigan were at low risk.

“And then it all went to hell,” Seglund says.

Seglund spent the next three summers studying Brown-capped Rosy-Finches, another vulnerable alpine species. She noticed that instead of needing hats and gloves, she and her colleagues were comfortable in T-shirts and hot enough to swim in frigid lakes in September. Afternoon rainstorms all but vanished. She kept an eye out for ptarmigan and seemed to spot fewer, most of them male. At times they dropped to lower elevations, seeking shade below dense willows. Despite the temporary reprieve, they were panting.

By 2021, Seglund was concerned enough to resume ptarmigan surveys. What her team has discovered is troubling. Counts in 2011 found males and females in almost equal numbers—fitting for a monogamous species. But a decade later, the split was 67 males to 33 females, and in 2022, 75 to 25. “The signal has just changed so drastically,” Seglund says. If hen numbers continue to plummet, the whole population could follow. Past research has found that female ptarmigan, stressed by raising young, tend not to live as long as males. Now Seglund is concerned that heat may be further abbreviating their lifespans.



A ptarmigan captured in Colorado peers out from its box (above) in New Mexico as biologists prepare to carry it into alpine habitat for release (below).

That link hasn’t yet been established, but climate change seems to have its fingerprints all over another trend: At a pair of long-monitored Colorado sites, ptarmigan breed 9 to 12 days earlier than they did when research began in 1968, according to a 2016 study. So far their breeding still seems to align with when insects and plants emerge, but if hatching becomes mistimed, chicks could go hungry.

It’s not clear how flexible ptarmigan will be in adapting to higher average temperatures, longer strings of hot days, or increasingly extreme weather, says Cameron Aldridge, a U.S. Geological Survey ecologist who coauthored that study: “We don’t know where the thresholds are,” Aldridge has seen early springs strand birds in winter-white plumage on brown tundra. “The science isn’t telling us we’re going to lose ptarmigan next year,” he says. “The science is telling us we should be concerned that if climate change continues, we’re not totally certain if these birds are going to be able to cope.”

So far, USGS biologist Gregory Wann, another coauthor, says he’s seen ptarmigan adjusting how they use the landscape, moving not off mountaintops but into wet, shady crevices among boulders or onto ice fields, where temperatures are 10 to 20 degrees cooler. Elsewhere, however, circumstances have compelled researchers to consider whether some habitats have become too hostile for ptarmigan to endure.

BILL TAYLOR SITS IN A TRUCK PARKED IN THE shade at a municipal airport in Las Vegas, New Mexico, his eyes fixed on the runway. The moment a twin-prop plane touches down, he cranks on the truck’s air-conditioning. The only passengers on the flight are five ptarmigan that biologists captured this morning in Colorado, outfitted with radio collars, and bundled into cardboard pet carriers. It’s September 2023 and these are among the first of 23 birds that will be transplanted this month. Taylor, northwest regional wildlife biologist for the New Mexico Department of Game and Fish, is tasked with keeping them cool as he transports them to a trailhead in the Sangre de Cristo Mountains.

With the featherweight boxes secured in the truck’s back seat, Taylor drives up into the peaks to a campsite ringed in spruce, fir, and aspen. As evening descends, he moves the birds to the truck bed—in a dog kennel to protect them from skunks, foxes, or owls that might come looking for a snack—and listens gladly to them rattling their boxes. “Sounds like they’re real strong, healthy birds,” he says.

In the morning, as peach rims the sky, he straps the boxes to backpack frames that two other wildlife biologists, Marina McCampbell and Jena Nierman, gently shoulder. The pair sets off on a trail that climbs about four miles to a ridge in the Pecos Wilderness, home to the warmest and most isolated archipelago in the bird's range. As they ascend, a few downy feathers drift out of the boxes. A dark eye peers through an air hole. The three ptarmigan Nierman carries thump constantly, shaking the boxes against her back. "It's like a little motivation to keep going," she says.

New Mexico's mountains host wildlife and plants otherwise bound to more northern latitudes, including White-tailed Ptarmigan. "No better proof could be found of the valuable diversity of climate of the Southwest than the presence of this purely Arctic bird on the high peaks," wrote conservation icon Aldo Leopold, once supervisor of the surrounding national forest. Fossil evidence suggests that ptarmigan lived even farther south thousands of years ago, but by 1980 biologists found only a handful statewide. In 1981, attempting a recovery, wildlife managers moved 43 ptarmigan from Colorado to New Mexico. That population persisted for about three decades before it, too, faded out. By 2018 the state game and fish department considered the birds functionally extinct in New Mexico.

Now department biologists are trying to rebuild the population. In 2021 they moved 24 ptarmigan from Colorado to New Mexico. They planned to bring another round the following year, but a wildfire delayed those transplants, some of which McCampbell and Nierman are releasing today. The hope is that the new arrivals will form a self-sustaining population and that monitoring them will reveal thresholds for the birds' survival.

Tasked with keeping tabs on the transplants is James Lee, a graduate research assistant with New Mexico State University. Searching ridgelines in late August 2022, he found fewer ptarmigan than expected, and there was no sign of chicks—not encouraging, but the wildfire might have been to blame. Today he joins up with McCampbell and Nierman as they head up a trail he's hiked several times a week since May.

James Lee, backpack loaded with ptarmigan, hikes into New Mexico's Pecos Wilderness, home to the warmest archipelago in the bird's range.

After an hour, a rocky, wind-scoured ridge that marks an entry to some of New Mexico's highest peaks comes into view; in another hour, the researchers are atop it. The official end of summer is still a few weeks away, but it's already autumn up here. The short grass is crisp, and alpine avens—wildflowers with green, fernlike fronds and yellow blossoms in summer—are tinged red. That's a favorite ptarmigan food, Lee says, "like popcorn." McCampbell lifts the first ptarmigan from a box, and it bursts from her hands. As she opens the flap over the second one, it launches in a flutter. "They're spring-loaded," Lee says, watching as the next two take off. The last ptarmigan lingers to preen ruffled feathers and scratch its chin with a foot. At noon a text message announces that more birds have been caught in Colorado. The team will hike down to the trailhead to collect the new arrivals and do it all again tomorrow.

Seglund isn't convinced that moving the birds to New Mexico will be any more successful this time around; the state never held a sizable population, and its already marginal and isolated habitat likely can't sustain ptarmigan for long, she says. She agreed to the plan only with tight limits set on the numbers—no more than two females or five birds total from any one site—to protect Colorado's populations.

But translocations have worked in the past. Seglund describes wildlife agencies swapping animals like trading cards in the 1970s, including 55 ptarmigan sent from Colorado to Utah's Uinta Mountains in 1976. She horse-packed 17 miles to check on them in July 2024, and a ptarmigan promptly responded to the first call she broadcast. Likewise, birds that were moved to California in 1971 and '72 have survived and spread. With climate change, the idea of relocating wildlife to better habitat, regardless of where they used to live, has gained favor. In 2023 the FWS revised regulations to allow moving an endangered species to new habitat if its native range is no longer suitable, a process often called assisted migration or managed relocation.

New Mexico law requires wildlife managers to try to recover vanishing native species, but that's not the only reason to give it a shot, says John Bulger, terrestrial recovery coordinator for the state game and fish department. "If there comes a point where you just have to say, 'Well, they can't live here anymore,' fine," he says. "But we can't and shouldn't just speculate." Genetic studies suggest that ptarmigan can adapt to local food sources and climates; scientists even found evidence of a heat-tolerant gene among ptarmigan from New Mexico, though it's not clear if any survivors still carry that adaptation.

In spring 2024, Bulger flew over New Mexico's White-tailed Ptarmigan habitat to scan for beeps from radio collars. He found 23 birds from the two rounds of translocations. Snow fell late into spring, so it was mid-June before the trail was clear enough to hike to that ridgeline, but he liked what he found when he finally got there. Ptarmigan had spread out over most of their core historic range. Three females were nesting.

A COLORADO FIELD TECHNICIAN NEEDS TO be in ptarmigan habitat before sunrise, so training days begin in the dark. On a June morning in 2024, nine recruits do their best to keep up with Seglund as she hikes into an emerald basin threaded with waterfalls in the San Juan Mountains. She coaches them on spotting ptarmigan and on safely navigating the complex terrain. Her sure-footed and steady pace speaks to summer after summer spent up in the alpine.

Between now and September they'll visit about 60 plots. A day's work might involve hiking 20 miles over multiple mountain passes, post-holing through snow, bushwhacking through willows, and dodging thunderstorms. When the trainees spot a bird, they record its habitat, such as a rock outcropping at 12,000 feet with one scrubby willow and a jeep road nearby.

Noting roads and other signs of human disturbance matters because there's more troubling ptarmigan than warmer weather. Snowmobilers, snowshoers, and backcountry skiers can disturb roosting birds and trample snow they burrow into for food and shelter. Hikers and their dogs in summer can also flush females off nests or away from chicks. And while Colorado Parks and Wildlife considers ptarmigan a vulnerable species, hunting is still allowed. What the field crew finds could prompt calls for public land managers to steer recreationists elsewhere or changing hunting regulations.

Studies suggest that ptarmigan can adapt to local food sources and climates.

The summer 2024 fieldwork findings were mixed. Sex ratios were not as skewed, and flocks were a little bigger, but the birds were missing from more places than in past years. Now Seglund is gathering researchers to launch a more intensive investigation, which could start as soon as next summer. Conservationists will be watching as they consider whether to revisit protected status for the species. "It just seems like we're going to have to do this for a while to really figure out what's happening," Seglund says.

The survey crew spends that first June day climbing ridges and circling cobalt lakes streaked with ice, searching, playing calls, and waiting. Males come screeching in, but none seems to have a mate. Finally, in early afternoon, they follow a piercing reply, rock-hopping across a bog to a lakeside knoll where a male ptarmigan perches. Two field technicians edge near it; then one looks up at Seglund and flashes two thumbs up: They've also found a female.

Such a find would have been unremarkable when Seglund started her surveys. "Now," she says, "it seems like a big deal." She and the others sit on an outcropping as the hen creeps forward one densely feathered foot at a time, emerging enough to show her handsomely speckled sides. When she flies over a sliver of snow, the crew murmurs in amusement. She's not really a rare bird, but the chance to watch her feels precious.

Independent journalist **ELIZABETH MILLER** *is based in New Mexico and has written about wildlife and environmental issues for publications including* bioGraphic, Undark, *and* Backpacker. *Photographer* **CHRISTINA M. SELBY** *lives in Santa Fe and focuses on documenting the beauty and changes taking place in the Southwest and beyond.*

A radio-collared White-tailed Ptarmigan surveys its new home in New Mexico's Sangre de Cristo Mountains.

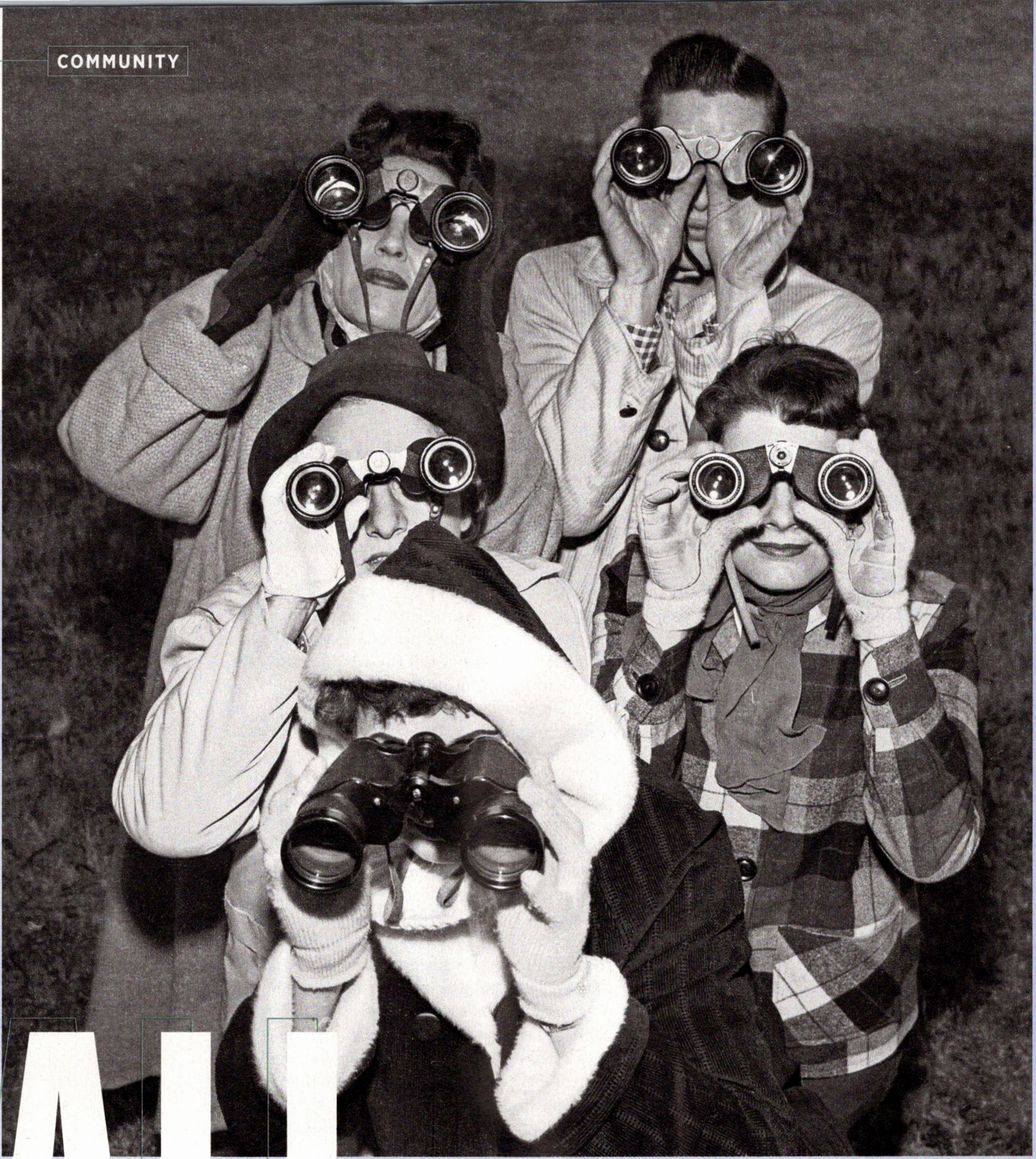


PHOTO: COURTESY FORT WORTH STAR-TELEGRAM COLLECTION, SPECIAL COLLECTIONS, THE UNIVERSITY OF TEXAS AT ARLINGTON LIBRARIES

ALL TOGETHER NOW

On its 125th anniversary, Audubon's annual Christmas Bird Count is a fun tradition for more people than ever—and a growing force for science and nature conservation.

BY RENE EBERSOLE

Styles may change over decades, but enthusiasm for the CBC only grows. Fort Worth Audubon Society members in 1963 (opposite); counters in New York's Central Park in 2015 (this page).

PHOTO: CAMILLA CEREA/AUDUBON

THE KILLING GAMES WERE COMING to an end. At the turn of the 20th century fewer sportsmen were participating in bygone Christmas Day "side hunts," competitions in which hunters would split into teams and set out on a "cheerful mission of killing practically everything in fur or feathers that crossed their path," as ornithologist and editor Frank Chapman described in the pages of *Bird-Lore*, the precursor to *Audubon* magazine. "We are not certain that the side hunt is wholly a thing of the past, but we feel assured that no reputable sportsman's journal of today would venture to publish an account of one, unless it were to condemn it; and this very radical change of tone is one of the significant signs of the times."

Chapman had a proposal: Replace the side hunt with a new tradition of observing and tallying birds, what he called a "Christmas bird-census." He urged readers to mail their "hunt" report to *Bird-Lore*'s Englewood, New Jersey, office by bedtime on Christmas. The reports should include the locality, when the count began and stopped, the air temperature, the character of the weather, the direction and force of the wind, and the total number of individuals of each species observed. He promised to publish the results in the February edition of the magazine.

Responding to Chapman's call, on Christmas Day, 1900, 27 enthusiastic participants fanned out in 25 locations across the United States and Canada, tallying 89 species in total. From there, the idea spread quickly. Soon the Christmas Bird Count (CBC), as it became known, was being held in every state and across Canada. It even carried on through the height of World Wars I and II, when many people couldn't participate because they were caught up in the fighting overseas (though a few did submit reports from abroad).

Today some 80,000 volunteers conduct local counts each year at more than 2,000 sites in the United States, nearly 500 in Canada, and 180-plus in Latin America, the Caribbean, and the Pacific Islands. The Christmas Bird Count has become the nation's longest-running community science effort on birds and a vital resource for researchers. The program provides data that scientists and wildlife managers use to establish bird population trends, observe how animals are responding to environmental threats, and recommend actions to protect birds and their habitats as temperatures warm, sea levels rise, and human use of the landscape changes.

"The Christmas Bird Count is one of the most valuable data sources we have for understanding how birds have responded to global change, particularly in North America," says Brooke Bateman, Audubon's senior director of climate and community science. "The fact that it goes back to 1900 and has been done consistently since then really gives us so much information."

This trove of information has helped usher in entire new areas of research, like climate change ecology, says Benjamin Zuckerberg, a researcher at the University of Wisconsin-Madison. His work in the field utilizes large community science datasets to explore how birds, including common winter denizens such as Red-bellied Woodpeckers, Purple Finches, and Carolina Wrens, are shifting their movements in response to changes in temperatures. The data enable scientists to find answers to questions at an "unprecedented" level, Zuckerberg says.

Stanford University retired biologist Terry L. Root, for instance, used data from counts in the 1960s and 1970s to embark on some of the first research into how environmental changes affect birds. When she used the CBC data to examine bird distributions on a continent-wide scale, the influence of climate became clear. The Eastern Phoebe's winter range, for instance, was restricted to areas where the temperature stayed at 25 degrees Fahrenheit or higher in January. It was a revelation. "I know it seems obvious now that birds' ranges are limited by temperature, but I promise you: In the late 1980s, that was not obvious," Root says. "Folks back then thought that competition with other species of birds was what limited species ranges. They could not see the effects of climate when the study areas were so small."

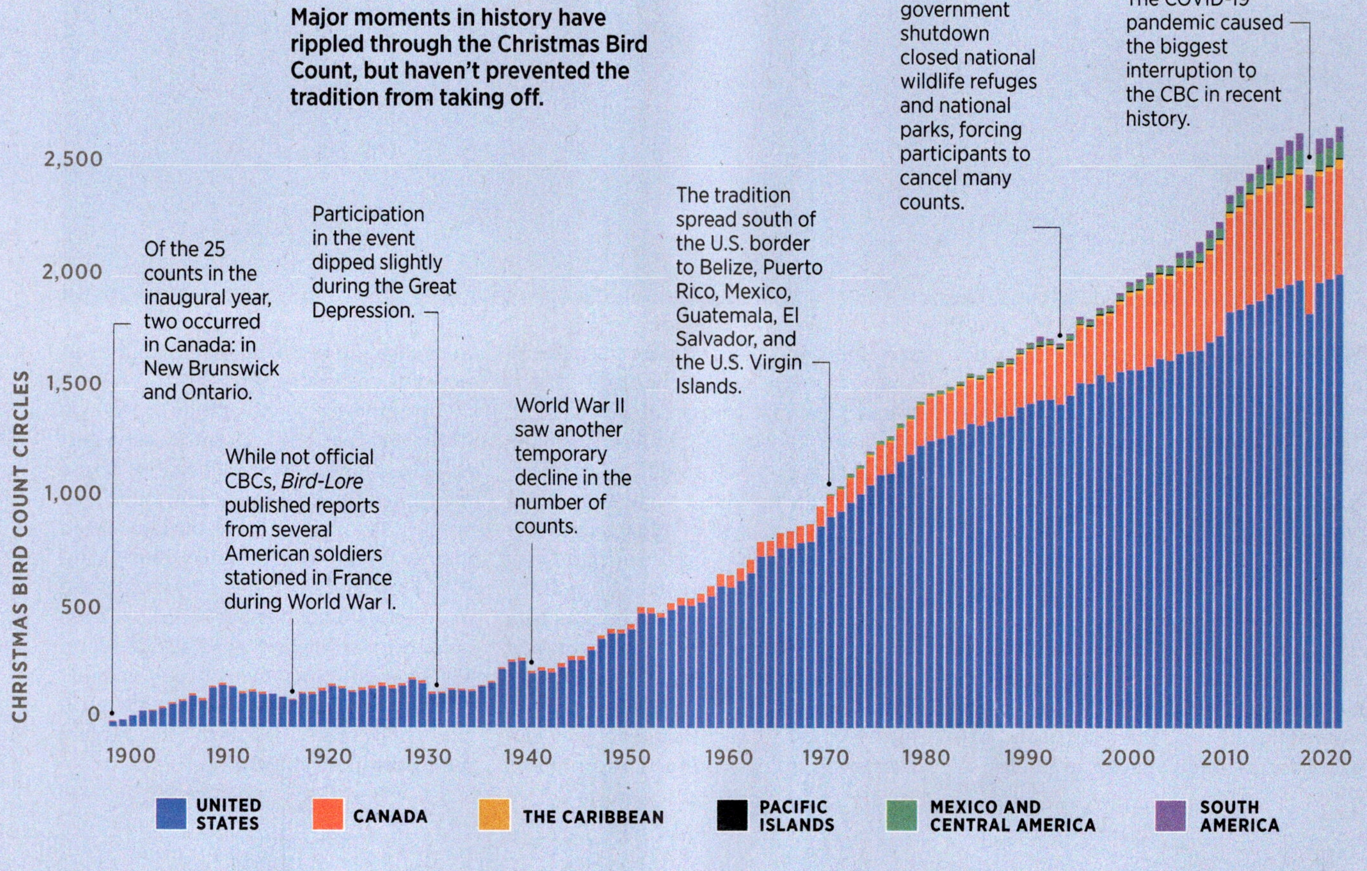
Since Root's pioneering investigation, more and more researchers have delved into the data to better understand birds' movements and factors that influence where they live. A report by the U.S. Environmental Protection Agency based on CBC data from 1966 to 2013, for example, concluded that in that span, more than 60 percent of 305 species moved their wintering grounds north. Nearly 50 of those species shifted more than 200 miles.

More recently, Audubon's science team found that waterfowl populations are migrating shorter distances. Analyzing 50 years of records on 16 common duck species, they found that as winters have warmed, making food and water more readily available, the majority of those species, including Northern Pintails, American Black Ducks, and Northern Shovelers, have become more common in the north and less common or stable in their traditional southern wintering grounds.

CBC data have also revealed that changing land use, such as draining wetlands for development and plowing grasslands for farming, is likely having an even greater influence than climate change on species that require specialized habitats, such as waterbirds, grassland birds, and waterfowl, Audubon scientists reported in 2022. They discovered that over the past 90 years, alterations to the habitat that these birds depend on have accelerated across nearly 120 CBC

UP, UP, AND AWAY!

Major moments in history have rippled through the Christmas Bird Count, but haven't prevented the tradition from taking off.



Of the 25 counts in the inaugural year, two occurred in Canada: in New Brunswick and Ontario.

While not official CBCs, *Bird-Lore* published reports from several American soldiers stationed in France during World War I.

Participation in the event dipped slightly during the Great Depression.

World War II saw another temporary decline in the number of counts.

The tradition spread south of the U.S. border to Belize, Puerto Rico, Mexico, Guatemala, El Salvador, and the U.S. Virgin Islands.

A federal government shutdown closed national wildlife refuges and national parks, forcing participants to cancel many counts.

The COVID-19 pandemic caused the biggest interruption to the CBC in recent history.

GRAPHICS: JULIE ROSSMAN/AUDUBON. DATA: NATIONAL AUDUBON SOCIETY (2024). THE CHRISTMAS BIRD COUNT HISTORICAL RESULTS [ONLINE].

Participants count birds at La Reseda reservoir in Triángulo del Puma, Colombia, in December 2023.

circles. One-third of midwestern grasslands were converted to croplands, and two-thirds of Atlantic and Gulf Coast wetlands were drained and ditched for urban development. "There's this tug between climate and land use across the species' range," Bateman says—a finding that may not have been detectable without the CBC.

More discoveries are inevitable, especially because the data are available online and readily accessible to scientists worldwide—a relatively recent development. When Geoff LeBaron started as CBC director in 1987, participants received a 16-page booklet to record count information, then mailed it to Audubon, along with a fee to fund the publication of the results—a phone-book-like tome consisting of up to 700 pages. With the digitization of the archives in 2000, the program entered the modern computing era. The CBC is evolving in other important ways, too, says LeBaron, who recently retired: "We need to keep monitoring the birds, but we also have to think about who's doing the monitoring."

To that end, the CBC is expanding to encompass more places and people not historically represented in the program—including Latin America, where hundreds of migratory bird species overwinter. Last year alone saw 16 new CBCs in Cuba, 5 in Colombia, and more throughout the region. The effort goes beyond geography. Making the CBC more welcoming will help diversify participation, says Gregoriah Hartman Ruh, Audubon's director of network action

2

Fewest species tallied in a circle* (Spruce Grouse and Common Raven, Tok, Alaska)

412

Most species tallied in a circle* (Sumaco, Napo, Ecuador)

*124th CBC

THE MORE, THE MERRIER

Enthusiasm is the key trait for the CBC, says Cooper Farr, Audubon's community science manager. Organizers welcome newbies to help cover a circle 15 miles in diameter. Here's how to make the most of the tradition.

CHOOSE YOUR ADVENTURE

"Each count has its own unique flavor," Farr says, and may include options to bird by car, foot, boat, or ski or to monitor feeders within a circle. Find circles at **audubon.org/cbc**.

GET READY

Consider scouting your route before the count to get a sense of the birds you will likely see. Day-of, "dress warmer than you think you'll need to," Farr says, and bring water, hot drinks, and snacks.

GO GET 'EM

Don't stress—nobody expects novices to be ID whizzes, and you'll be paired with experienced counters. And if there's a post-count dinner, go! It's where everyone swaps stories and celebrates their joint effort.

PHOTO: LUIS BERNARDO CANO

TALLY TALES

IN THE FIRST YEAR OF THE LOST Pines count in Texas, we saw a Red-shouldered Hawk grab a Killdeer. Immediately after, a Merlin zoomed in and displaced the hawk. Then a harrier chased the Merlin away. And the Killdeer escaped! Better than any Disney wildlife adventure or Animal Planet video! *—Louise Ridlon*

I GOT A PHOTO OF MY GIRLFRIEND looking at a screech-owl on Pad 39B, where I supported Apollo 10. A ranger drives us around Kennedy Space Center, where I worked with NASA for 35 years, and it's always nostalgic to be out there. *—Jim Meyer*

ON DECEMBER 20, 1989, THE United States invaded Panama. Very few brave participants drove to the Atlantic Canal Area CBC and went through checkpoints, heavy combat equipment, and military force, and they managed to get to the census areas. The count came in second among all CBCs, with 310 species, second only to Panama's Pacific Canal Area (325 species). *—Rosabel Miro*

I WAS PAIRED WITH A SEASONED veteran for my first CBC in 2023. When I met him at a gas station, I jokingly told him I'd spotted our first bird: a chicken wandering nearby. He laughed and said, in the nicest way, that it wouldn't count for our purposes. That day we learned so much about each other's lives, traded Christmas cookie recipes, and discovered that we have the same spark bird: the Loggerhead Shrike. He taught me how to tell a Turkey Vulture from a Black Vulture in flight and the difference between Palm and Pine Warblers. I recorded many lifers that day, so early in my birding journey. *—Karina Jiménez*

ON MY FIRST CBC, I WENT OUT with Bill Cook, who became my first birding mentor. Even though I was already an advanced birder, he taught me how to navigate a CBC day and introduced me to the event's culture. It was a meaningful transition from being a kid birding with my supportive parents to a young adult finding a and leadership development. While many backyard bird enthusiasts have the skills to take part in a CBC, Hartman Ruh says, they might not have felt drawn in yet by their local Audubon chapter or birding club. And some people don't participate in events like the CBC because they feel unsafe; often birders are in remote locations, away from a car, without a quick escape route, ze explains. It's something Hartman Ruh experienced when in the field alone, but not when out with a group of trans birders: "We felt safe together." The key to making the CBC more inclusive, Hartman Ruh says, is to break down the stereotype of a birder, which an increasing number of Audubon chapters and CBC counts are striving to do.

In Manhattan, the site of one of the inaugural counts in 1900, the New York City Bird Alliance (formerly NYC Audubon) has made equity, diversity, inclusion, and accessibility central to its mission to engage more people with birds and nature. For this year's CBC, the organization is pairing experienced data compilers with new volunteer engagement leaders who will help ensure "no one's getting left behind, that there's someone there who can help answer questions and make sure that everyone is having fun," says Katherine Chen, who manages the group's community science programs. The group also plans to add more "slow birding counts," similar to one that launched two years ago in Madison Square Park, providing an opportunity for those with physical impairments or who require a slower pace. They are also hoping to introduce bilingual counts and new counts in areas that haven't been previously represented. "We do this because birding is and should be for everyone," says NYC Bird Alliance executive director Jessica Wilson, "and because it will take everyone involved to protect birds from the effects of climate change and biodiversity loss."

That's also the motivation driving the National Audubon Society's efforts to make the CBC more multicultural and

5 BIRDS SEEN MOST OFTEN

OF 2,675 CIRCLES LAST YEAR

EUROPEAN STARLING
2,296 circles

DOWNY WOODPECKER
2,269 circles

ROCK PIGEON
2,218 circles

HOUSE SPARROW
2,204 circles

BALD EAGLE
2,180 circles

5 BIRDS NEVER SEEN AGAIN

IVORY-BILLED WOODPECKER
Detected in 1929, 1933, and 1937; presumed extinct

HEATH HEN Detected in 1908; declared extinct in 1932

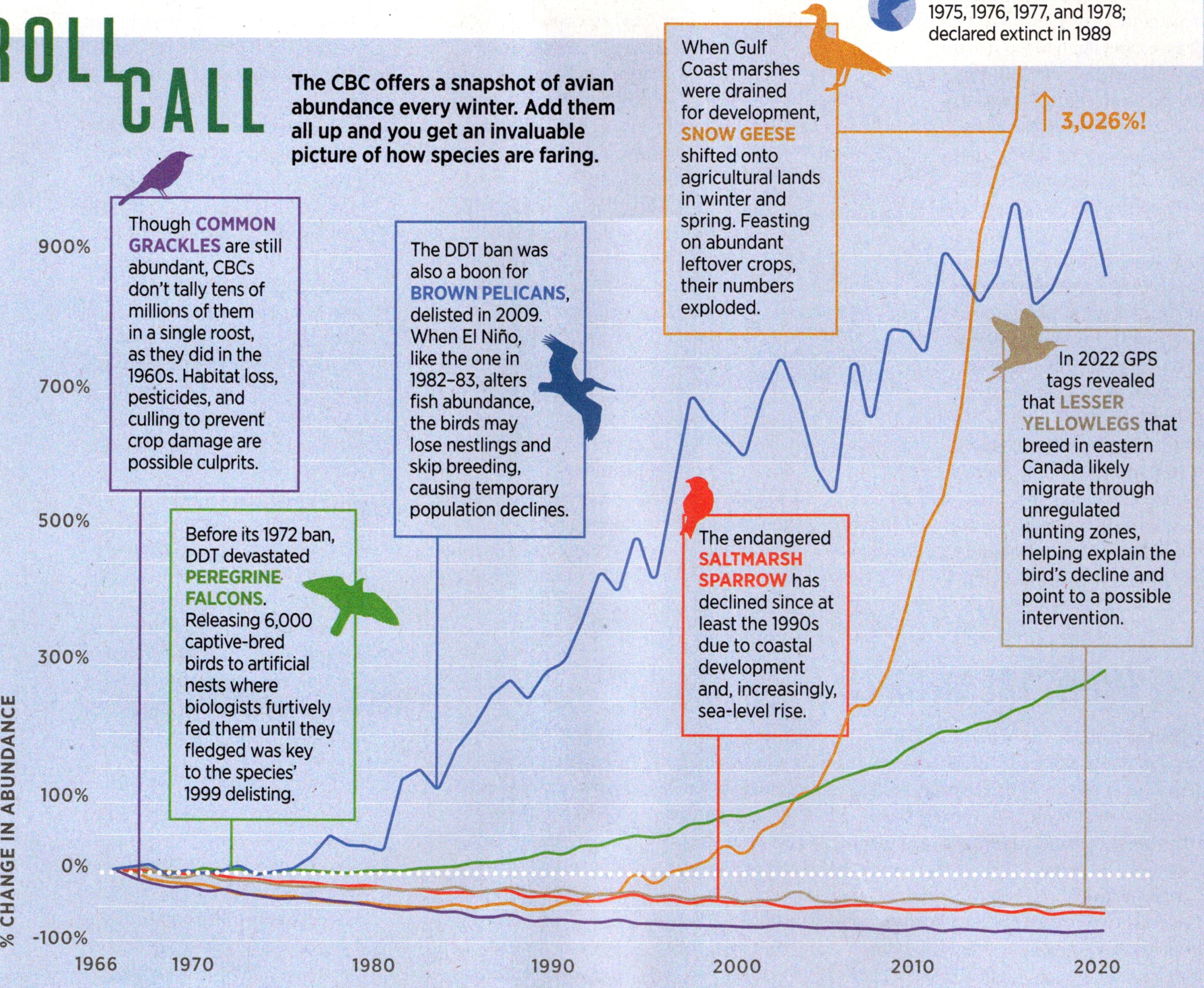
ʻOʻU Detected in 1977, 1978, 1979, and 1983; declared extinct in 2022

KAUAʻI ʻŌʻŌ Detected in 1973; declared extinct in 2023

ATITLÁN GREBE Detected in 1975, 1976, 1977, and 1978; declared extinct in 1989

ROLL CALL

The CBC offers a snapshot of avian abundance every winter. Add them all up and you get an invaluable picture of how species are faring.



Though **COMMON GRACKLES** are still abundant, CBCs don't tally tens of millions of them in a single roost, as they did in the 1960s. Habitat loss, pesticides, and culling to prevent crop damage are possible culprits.

Before its 1972 ban, DDT devastated **PEREGRINE FALCONS.** Releasing 6,000 captive-bred birds to artificial nests where biologists furtively fed them until they fledged was key to the species' 1999 delisting.

The DDT ban was also a boon for **BROWN PELICANS,** delisted in 2009. When El Niño, like the one in 1982–83, alters fish abundance, the birds may lose nestlings and skip breeding, causing temporary population declines.

When Gulf Coast marshes were drained for development, **SNOW GEESE** shifted onto agricultural lands in winter and spring. Feasting on abundant leftover crops, their numbers exploded.

The endangered **SALTMARSH SPARROW** has declined since at least the 1990s due to coastal development and, increasingly, sea-level rise.

In 2022 GPS tags revealed that **LESSER YELLOWLEGS** that breed in eastern Canada likely migrate through unregulated hunting zones, helping explain the bird's decline and point to a possible intervention.

GRAPHICS: JULIE ROSSMAN/AUDUBON. DATA: MEEHAN, T.D., LEBARON, G.S., DALE, K., KRUMP, A., MICHEL, N.L., WILSEY, C.B. (2022). TRENDS IN RELATIVE ABUNDANCE FOR BIRDS WINTERING IN THE CONTINENTAL USA AND CANADA: AUDUBON CHRISTMAS BIRD COUNTS, 1966-2021, VERSION 4.0. NATIONAL AUDUBON SOCIETY.

Counters cover a route in Stonington, Connecticut, last year organized by Birdability, which provides tools to help make birding more inviting and accessible to people with disabilities.

PHOTO: MIKE FERNANDEZ/AUDUBON

multigenerational. The organization is partnering with North Carolina State University researchers on a National Science Foundation–funded pilot program, called IDEAL, aimed at increasing involvement among new birders and within communities underrepresented in the tradition. This past summer 16 CBC leaders from 11 count circles took part in trainings where they thought expansively about how to recruit new participants—ideas that they are now implementing.

Lauren Whitenack is the vice president of Lahontan Audubon Society in northwest Nevada and chair of the organization's equity, diversity, inclusion, and belonging committee. After participating in the IDEAL training, she distributed a demographic survey to Christmas bird counters in Reno to better understand who has been excluded or underrepresented in the past. One finding: There were no participants from the LGBTQIA+ community. Now the Audubon chapter is forming an advisory committee made up of members from that community who receive a small honorarium for their time and expertise and a free one-year membership to the organization. This year, the group's CBC will offer multiple ways for new volunteers to get involved, including a group walk geared toward beginners at a local park and compilers buddying up with participants taking part for the first time.

Inclusion isn't about teaching more types of people to enjoy birds, says North Carolina State University ecologist Caren Cooper, who is collaborating with Audubon on the IDEAL program.

"Inclusion involves changing the project environment so more people feel a sense of belonging, rather than keeping everything the same and asking people to change in order to fit in," she says. "If we are inclusive, then the love of birds can unite people." The CBC of the future might look a little different than in the past, but it will provide even more rigorous data, across more areas, if a wider variety of people are collecting the information, Cooper says.

Chapman likely never imagined that his plea more than a century ago for people to count instead of kill birds would expand to such proportions. From its humble beginnings, the Christmas Bird Count has become an indispensable tool for understanding bird populations and trends and helping to protect species and habitats—and it will grow stronger with each new year, circle, and volunteer.

Northernmost circle*: Arctic Bay, Nunavut, Canada

Southernmost circle*: Drake Passage, South Atlantic Ocean

*124th CBC

Contributing editor **RENE EBERSOLE** *also writes for* National Geographic, Rolling Stone, *and other outlets. Her last* Audubon *feature explored how to fortify the Endangered Species Act for the coming decades.*

community. Since then, I've made it a mission to support and strengthen the local birding community where I live. —*Chad Witko*

BEGINNER'S LUCK ALWAYS HAS A positive effect on CBCs. On one Rhode Island count, I was accompanied by a friend who had only done a couple of CBCs, and we had one of the most exciting days of birding that I've ever had in New England. After starting the day with Northern Waterthrush, a very rare species on any CBC in the region, we found two Red-headed Woodpeckers and a Barrow's Goldeneye, all very desired birds. Then, as the sun was setting, we found a Western Tanager, my first in eastern North America and a first for the nearly 70-year history of the count! —*Geoff LeBaron*

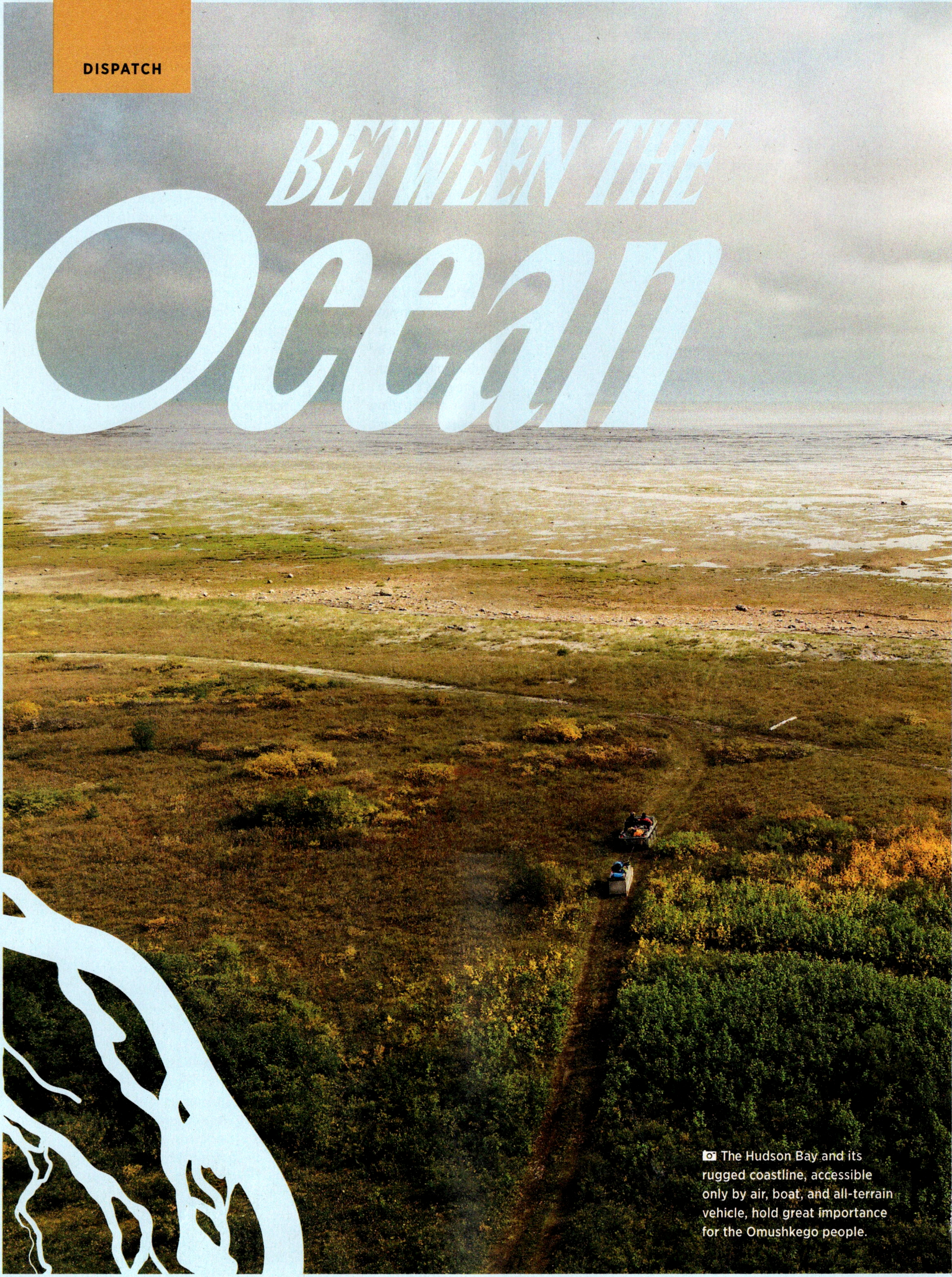
THIS YEAR WILL BE THE CHAMPLAIN Islands CBC's 42nd year. All three circles hold a potluck after the count, and that's the best part of the day, sharing food and birding stories with people you might only see once a year. —*Kenneth Copenhaver*

IN MINDO, ECUADOR, THE CBC is a celebration of the diversity of birds and the preservation of nature. Every year we have a party the night before our bird count, where local dance groups perform; we design new T-shirts for all participants; and we organize one or two routes for middle schoolers, to teach the next generation of birdwatchers. And as our circle consistently ranks among the highest in terms of the number of species, it has had a big impact in promoting conservation and ecotourism in our area. —*Nicole Büttner*

THE LARGEST FLOCK OF BIRDS I have ever seen was in Pine Prairie, Louisiana. Historically the area has had major concentrations of wintering blackbirds that feed on waste grain, mostly rice. Departure flights from these roosts were massive, difficult to describe, and a challenge to make accurate estimates. The 1987 main morning departure flight from the swamps in the middle of the CBC was a continuous, dense sheet of blackbirds flying in a flock which was five miles wide and took 45 minutes to pass. —*Brent Ortego*

DISPATCH

BETWEEN THE Ocean

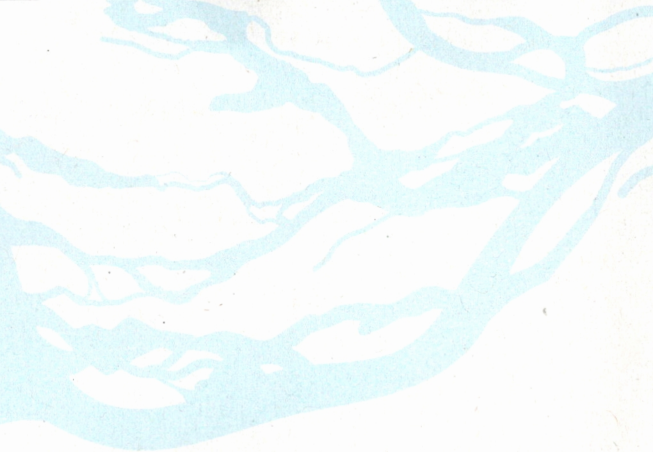


The Hudson Bay and its rugged coastline, accessible only by air, boat, and all-terrain vehicle, hold great importance for the Omushkego people.

AND THE Shore

In northern Ontario, First Nations are working to formally safeguard a marine ecosystem in a region critical for migratory birds. They are on the cusp of an important win, and their vision is even bigger.

BY SARAH SAX
PHOTOGRAPHY BY SYDNEY WALSH



Polar bears and sandpipers rely on this coast in late summer. It's perfectly situated as a rest stop for birds that migrate south in fall.

BINOCULARS GLUED TO HER FACE, CARRIE Gray yells "Bear!" from the roof of a two-room plywood cabin perched on the edge of Ontario's Hudson Bay. I drop my tent poles mid-setup and rush up a rickety ladder. From the vantage above the stunted spruce and willows, we spot the polar bear on a beach ridge a quarter-mile away. I take a grainy phone photo as it ambles across the sulfuric mudflats that emerge from the ebb tide. On the horizon, the ocean glitters like a mirage.

Our visiting group has just arrived after a day and a half of traveling across Canada's boreal forest via car, air, boat, and amphibious all-terrain vehicle. I'm thrilled and terrified to see one of the massive predators, but Sam Hunter, the Weenusk First Nation natural resource monitor who has invited us to his hunting cabin, seems unfazed. "Last time I came out, there was a big one right between my cabin and the outhouse," he calls from below as he sets up our base camp.

Looking at a map, you might not expect to spot the iconic Arctic species this far south. Spanning roughly the same latitudes as Glasgow to London, the geography of the north Ontario coast creates a singular subarctic ecosystem. Beyond the shore, the immense Hudson Bay and its southern extension, James Bay—or Washaybeyoh and Weeneebeg in the Cree language—form a shallow, inland sea fed by both freshwater rivers and cold ocean currents from the far north. As a result, sea ice forms in winter, sustaining this southernmost polar bear population as well as walruses, beluga whales, and Arctic foxes.

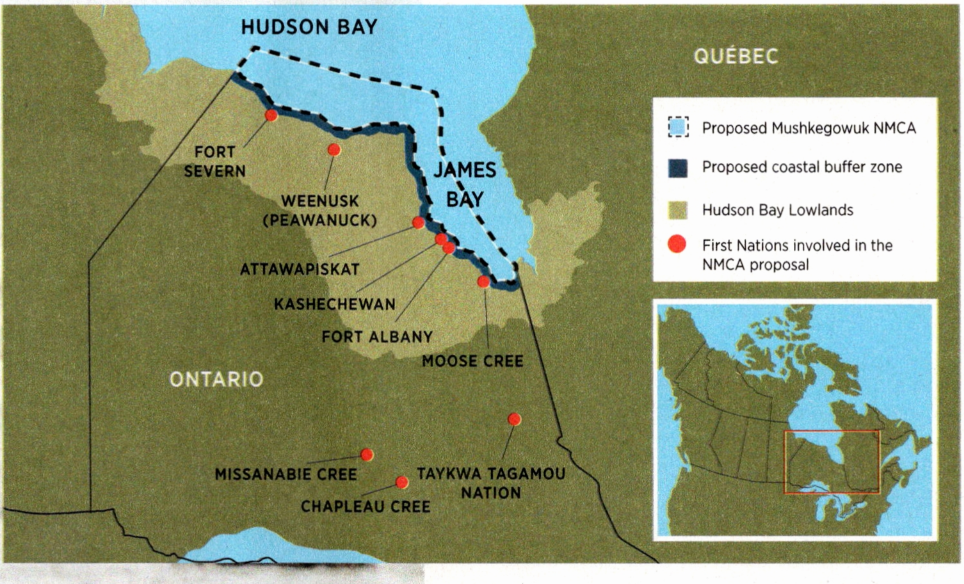
While the bear has briefly captured her attention, Gray, Audubon's boreal conservation specialist, is most interested in the region's birds. Roughly 170 species, including millions of migrating shorebirds and waterfowl, breed or stop over amid the sprawling estuaries, spongy marshes on this coast. In late summer, the area becomes a major avian staging area: At least 25 shorebird species stay for several weeks to put on fat that fuels their journeys south.

To track these migrations, a team from Audubon and the Wildlands League, a Canadian conservation group, are here to set up a radio receiver tower, called a Motus station, at Hunter's cabin. If all goes well, the data it collects will plug into a global database that conservationists are using to fill in gaps about avian life cycles and protect places birds need. Amid rapid global habitat loss, the intact ecosystem on this coastline especially stands out: "We live in a very carved-up landscape. Even if you live in a rural area, it's been shaped by agriculture and farming," Gray tells me. "This gives you a sense of what the planet used to be."

This, of course, is the landscape that Hunter and his ancestors have always known. Since time immemorial, the Omushkego people, which consist of a number of First Nations, have traveled from remote communities to seasonal camps to hunt Canada and Snow Geese on the coast, fish for brook trout in rivers, and track caribou and moose. Hunter, who was born at his family's camp on the Sutton River, says that traditional foods make up a significant part of many people's diets.

Today, however, Omushkego communities worry that encroaching mining and mounting effects of climate change threaten their way of life. And so nine First Nations are crafting a plan to protect a marine area the size of Maine—what they hope will be a first step toward conserving a larger swath of their territory.

MAP: EMILY RENAUD/AUDUBON. DATA: FIRST NATIONS, HUDSON BAY LOWLANDS, OPEN GOVERNMENT LICENCE, CANADA (2024); PROPOSED NMCA AND COASTAL BUFFER ZONE: MUSHKEGOWUK COUNCIL (2024)



> **The geography of the north Ontario coast creates a singular subarctic ecosystem.**

They know there is urgency to formally safeguard these vital ecosystems for the future. There is also unprecedented opportunity.

THE OMUSHKEGO NAME RELATES TO THE region's muskeg: the bogs, fens, and mires of the boreal biome. In addition to an 800-mile coast, the Omushkego traditional territory covers nearly one-third of Ontario, including part of the Hudson Bay Lowlands, a peatland complex that stretches from Manitoba to Québec and may hold more carbon than the Amazon. The spongy peat that sucks at our boots and surrounds their communities has helped keep most industrial development at bay, since the land is largely impassable until it freezes, and then can only be accessed on rough ice roads.

Despite the difficult terrain, threats mounted in the 1980s, says Lawrence Martin, director of lands and resources for the Mushkegowuk Council, which represents seven First Nations. The nickel and copper industry in Ontario began expanding its reach northward, and politicians resurrected the alarming notion of building the Great Recycling and Northern Development Canal, a scheme to dam James Bay and divert water to the Great Lakes, which would destroy the bay's unique ecosystem. Climate change, meanwhile, was altering animal migrations, decreasing fish abundance, and increasing pest outbreaks in trees.

Such concerns prompted the Mushkegowuk Council to issue its first formal resolution to protect lands and waters in 1989. In the following decades it passed dozens more, all aimed at preserving what the Omushkego call the Breathing Lands and Birthing Lands: the carbon-rich peatlands and diverse coastline and waters, respectively. But the council lacked the money and political partners needed to realize these goals.

That changed in 2019 when Canada announced it would increase its support for protected areas and backed that up with hundreds of millions of dollars and a pledge to prioritize Indigenous-led initiatives. The government now aims to protect 30 percent of its lands and oceans by 2030, including by creating 14 new national marine conservation areas (NMCAs) that safeguard marine and freshwater ecosystems for the benefit of all. In 2019, the Cree Nation of Eeyou Istchee signed an agreement with the federal government to explore an NMCA in the eastern half of James Bay. These coinciding developments spurred the Mushkegowuk Council, along with the nearby Weenusk (Peawanuck) and Fort Severn First Nations, to try for their own proposal, says Martin.

This kind of support is a welcome change from the past, when legacy national and provincial parks were created on Indigenous territory—without consultation or regard for local knowledge, rights, or needs, says Valérie Courtois, director of the Indigenous Leadership Initiative, a conservation group in Canada. These days, more Indigenous nations are actively working with federal and provincial governments to conserve and manage habitat, and most new protected areas are created in collaboration. While there are challenges, she

says, "There are not very many instances where Canadians are proud of their legacy with Indigenous peoples, but this is one where great things are happening."

In 2021 the Mushkegowuk Council secured a $2.2 million grant to shape the plan and conduct a feasibility study. Martin and his team, along with research coordinators from each community, conducted 124 interviews to document how people use the land and waters and their knowledge of wildlife. They also held dozens of community meetings to gather feedback about marine and coastal protection goals. Several outside groups, including the Wildlands League and Audubon, offered their policy and scientific support. Gray, for example, gave presentations about the region's importance to the global conservation of avian migrants: "People don't always agree about everything," she says, "but they agree about the birds."

Other conversations were long and sometimes heated, Martin says. Some community members and chiefs were wary of negotiating agreements that could govern the use of their land, such as those in Attawapiskat, a village downstream from a now-decommissioned diamond mine. In 2021, the mine's owners pled guilty to failing to report monitoring data for mercury, a pollutant toxic to people and wildlife. Others were skeptical given the government's history of neglect of basic services like plumbing, health care, and electricity, and the traumatic and often abusive legacy of residential schools that separated families.

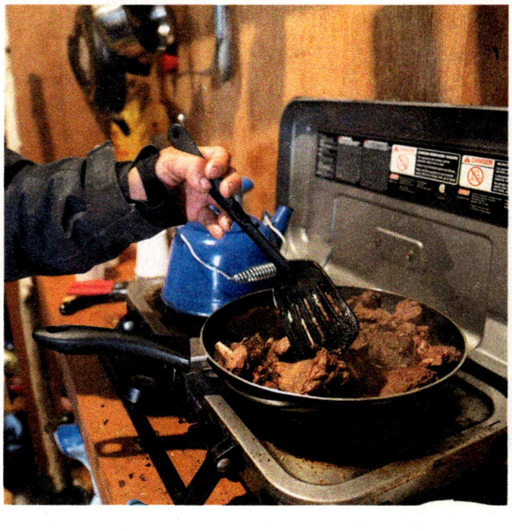
The process was, in many ways, just as important as the outcome. Self-determination is at the core of the modern Indigenous movement, and conservation is an important way this plays out, says Wildlands League conservation director Anna Baggio. Lori Macadam, director of NMCA establishment for Parks Canada, agrees that it was essential for the First Nations to lead the way. "Ultimately, Parks Canada isn't the only decision maker," she says.

In February, the government of Canada and the Mushkegowuk Council announced the feasibility study's completion and the proposed boundaries of an NMCA that would protect a 33,204-square-mile area of ocean from bottom trawling, dumping, oil and gas drilling, and other industrial development. Once formalized, it would be among the largest of the five existing NMCAs in Canada. As of press time, most of the First Nation chiefs who were involved had signed off on the study's recommendations.

Beyond formal protection, the council and Omushkego land users like Hunter also hope a conservation area will attract opportunity for more local research, conducted by and with Indigenous community members. Setting up a Motus station at Hunter's cabin could be just the beginning.

AS EVENING NEARS AT THE CABIN, NICK MACK and Gregory Patrick, Cree guides who drive vehicles on our trip and use rifles to scare off curious bears, join Hunter in cooking Canada Goose canned in the spring. The rest of us heat vacuum-sealed curry on a camping stove.

After dinner, Audubon migration ecologist Bill DeLuca turns to the Motus station. Its parts spread like



Sam Hunter (above) cooks up Canada Goose (below) hunted in the spring. Carrie Gray (opposite) checks a field guide to identify the area's many shorebirds.

unassembled Ikea furniture, he debates a construction plan with the Wildlands League's Dave Pearce and Trevor Hesselink. Hunter shuts down their first few ideas. If they mount the tower on a tripod to the roof, hurricane-strength gales could tear the antenna off. Put a solar panel on the ground, and snow could bury it. Plus, the bears: "They really just like to mess with things," Hunter says.

Together, they hit upon a solution: Secure the 10-foot pole to the side of the building with what Mack christens "Cree clamps"—durable snowmobile belts drilled into the framing. The antenna will stick only a few feet up above the roof, and Hunter will affix the solar panels to the side of a new cabin addition he plans to build before the snow comes in. Standing on the roof, Hesselink appraises the setup. "It makes it look like the highest-tech shed," he jokes.

The station will detect radio signals from tagged wildlife that pass nearby, forming the latest addition to the growing Motus Wildlife Tracking System: a global network of strategically placed stations that help scientists learn about animal migrations. The catch is that three-quarters of roughly 2,000 stations to date are in North America. In Canada, most are clustered near cities and the U.S. border in easy-to-access places. This station, DeLuca says, is among the most remote that Audubon has helped install. Doing so wouldn't be pragmatic without Hunter, who will periodically download data and maintain the structure.

The process was, in many ways, just as important as the outcome.

The data collected at this station, combined with that from others in the network, could shed light on which migrants rely on this habitat, when they arrive, how long they stay, and where they go next. It could offer insight, for example, into the migration timing for endangered *rufa* Red Knots and relatively rare Hudsonian Godwits, which leave the area on thousands-mile-long flights to South America. It could also, says Gray, help solve the mystery around the route that Lesser Yellowlegs, recently declared threatened in Canada, take south after they nest in the boreal forest—or elucidate the habits of Canada Geese and other common species that Indigenous communities depend upon.

Hunter is excited to learn more about the birds around him. Though he went to school for communications, he has a scientist's curiosity and has led expeditions for tourists and researchers for four-plus decades, since he was 14. He's become the council's unofficial conservation ambassador—"Our ear to the ground, so to speak, our eyes to the land," Martin says—and the point of contact for scientists who come through Peawanuck, where he lives when not at his camp.

Contributing to projects such as monitoring bears and whales or sampling the peatlands and rivers is, for Hunter, about more than collecting data. "It's thinking about the people, too," he says. For his community, global warming is an urgent threat. Just days before we arrived in August, Peawanuck reached an unheard-of 90 degrees Fahrenheit. Increasingly, low river levels hamper boat travel—the main means of summer transport—making it harder for him to hunt caribou and other animals. Every year the winter sea ice seems to form later, causing polar bears to become hungrier and more aggressive. Avian communities are changing, too: Flocks of Snow Geese are smaller and leave the area earlier than Hunter remembers from his youth; cormorants are showing up more often.

Scientists increasingly recognize the value of such frontline observations, rooted in Indigenous experience over generations. But the reverse is also true. Many Indigenous people are eager for information and collaboration that will help them navigate uncertainty and build resilience. "What's going to happen in the future 100 years from now and beyond?" Hunter asks. "We gotta know."

Back inside, DeLuca completes the final assembly by registering the new outpost in the Motus network's database. With a button's click, Hunter's two-room cabin lights up as a yellow dot on a map. Now he needs to name it. "Memphis's Station," Hunter says. Memphis is his grandson, and the name seems hopeful.

NAMES HOLD DEEP MEANING FOR THE Omushkego. As part of its engagement process, the Mushkegowuk Council put out a community version of its feasibility study, separate from the highly technical report produced with Parks Canada. It combines art, Indigenous knowledge, science, history, and more. An interview with Jeronimo Kataquapit, a university student from Attawapiskat who is studying geography and environmental management, inspired its title: "Tawich is where I belong."

Tawich roughly means "out toward the bay," Kataquapit says. It's as much of a direction as a place where rivers, land, and estuaries meet; there isn't a specific point where swampy marshes or tidal flats end and ocean begins. "For the Omushkego, there is no separation of land and water," Martin says. That's true for wildlife, too: Essentially all species here depend on land, rivers, and oceans as part of the same system.

The Omushkego vision reflects this philosophy. In addition to the NMCA, it proposes protecting a 12-mile-wide strip of land along the coastline—the area most vital for shorebirds and other species. But the NMCA is much farther along. As *Audubon* went to press, the Council was negotiating an establishing agreement with federal officials. These talks will determine budget and co-management details, like how many people will be employed to monitor and maintain the new reserve. It wasn't a done deal yet, but both sides are optimistic and determined to make it work.

Yet while the ocean and land flow seamlessly into each other for the Omushkego, Canadian law creates stricter boundaries: Because the land up to the low-tide mark falls under provincial jurisdiction, the council must work with Ontario's government to put protections in place for the coast. That has proven trickier. So far, the Mushkegowuk Council has not received a response to its request to discuss the proposal with Ontario's Ministry of the Environment, Conservation and Parks. This past September, Leo Friday, Grand Chief of the Mushkegowuk Council, publicly put the request to Ontario Premier Doug Ford. "The province has not said no—but it hasn't responded," Martin says. (The ministry didn't respond to *Audubon*'s request for comment.)

Those involved suspect that Ontario's interest in mining is behind its silence. The province is one of the country's top mineral producers, with more extraction potentially on the way in a region known as the Ring of Fire, an inaccessible area surrounded by peatland that may hold vast deposits of nickel, platinum, and chromite, which are minerals in demand for the world's renewable energy transition. The area, about 180 miles south of Peawanuck and 120 miles west of Attawapiskat, is near the source of some of the main rivers that flow through Omushkego Territory to the coast and into the Hudson and James Bays. In addition to the potential pollution of these rivers, many are worried that building roads and other mining infrastructure would destroy fragile peatlands and release significant amounts of carbon, Martin says.

Several First Nations, including those in the Mushkegowuk Council, have called for a moratorium on mining and development in the Ring of Fire until a regional impact assessment is undertaken with strong Indigenous involvement. Mining claims in the region have skyrocketed, especially since the system was digitized in 2018, allowing anyone with a computer to easily stake one if an area isn't formally protected. But First Nations in the Hudson and James Bay watershed do hold some leverage: The Ring of Fire falls under a treaty that grants them rights to trap, hunt, and fish on treaty land; and some already are suing for a lack of consultation in mining exploration and planning.

For the Mushkegowuk Council, Ontario's cooperation is important beyond protecting a swath of shoreline. It will need the province's support for an even more expansive plan it's developing, aimed at protecting peatlands, watersheds, and biodiversity across the traditional territory. The Omushkego Wahkohtowin Conservation Plan was among four Indigenous conservation initiatives the federal government selected in 2022 to share in a $575 million pool under a new program that offers sustainable funding over 10 years. "It's not just conservation and then you got to scramble for money after the fact," says Baggio. "This is conservation and money to actually implement it."

The funds could support Indigenous guardians who monitor the land and wildlife, create jobs for hunters who improve food security for elders, help First Nations develop ecotourism, and guide land-use planning. The plan's name reflects the Council's modern approach to conservation. "Our conservation plan is based around the idea of Wahkohtowin. It means 'relationship building' in Cree," Martin says.

Forming a relationship with the mining industry could be an important, or inevitable, step to making the council's conservation goals a reality. Having met with company representatives, Martin believes there's a path for collaboration. Most want to avoid conflict with Indigenous communities, he says, and clear land-use planning is in their interest. "They want to know where they can mine or not," he says. "Conservation and critical mineral strategy can work hand in hand."

Bill DeLuca assembles part of the Motus station, which will detect signals from tagged birds that pass within range of Hunter's cabin.

TAKE ACTION

Sign a letter urging Ontario's government to protect this coastline at audubon.org/jamesbay.

Protecting the land and water isn't a choice but a responsibility.

ACROSS THE HEMISPHERE, THERE'S A GROWING push to create more protected areas, all under the umbrella of a global pledge to protect 30 percent of the world's land and ocean in this decade. Doing so must not only respect Indigenous rights, but also center their leadership, many advocates emphasize. Slowly, that idea is gaining traction: For example, in October the United States approved the Chumash Heritage National Marine Sanctuary in California—the nation's first to be nominated by tribes.

For Omushkego residents, a new NMCA wouldn't change much about daily life. "We don't see that many disturbances," says Kataquapit. But he realizes that change could come quickly and that formal protection is the best hedge against unwanted development. "If the NMCA weren't established, it would only be a matter of time until industry came into the bay. There would be nothing to stop them," he says. Protecting the land and water isn't a choice but a responsibility; at stake isn't just the ecosystem but also Omushkego culture, language, and identity: "Without the land, we aren't really our own people," he says.

Birds are also tied to this place. The routes they take, and places they stop, are often hardwired, making it harder to adapt to habitat destruction or climate shifts. "They can't just move to a new spot if there's development," Gray says. But while sensitive to disruptions, migrants offer a powerful means of confronting widespread environmental threats. "Motus stations don't just connect places; they also connect communities invested in protecting those birds," says DeLuca.

Hunter has been thinking about those connections more often. This past March, on a whim after connecting with fellow birders on Facebook, he traveled to the Argentina coast to see where Hudson and James Bay denizens, such as godwits and sandpipers, spend the nonbreeding season and to raise awareness about their decline. His first trip to South America gave him a newfound appreciation for birds that fly so far, sometimes in just a few days—a speed that awes him. "It took *me* five days to get down there," he says.

While there, Hunter was concerned to see sand buggies in some protected areas he visited. But the experience was also motivating: He hopes to collaborate to help godwits, sandpipers, and other migrants across their entire routes and varied habitats.

The day before our group departs, I join Hunter to collect water. With the recent heat and low rainfall, the rivers are low and warm, and we head upstream where the current runs strong. You can't separate what happens in one place from another, Hunter tells me as we load gallons on a sled to pull to camp. In the distance, a Motus station glints in the afternoon sun, and the ocean peels back silently from the shore. Ⓐ

Reporter **SARAH SAX** *covers conservation; her last feature in* Audubon *was about the Brazilian savanna. Audubon network photographer* **SYDNEY WALSH** *seeks to explore connections between humans and the natural world.*

PHOTO FROM CHILKAT BALD EAGLE PRESERVE

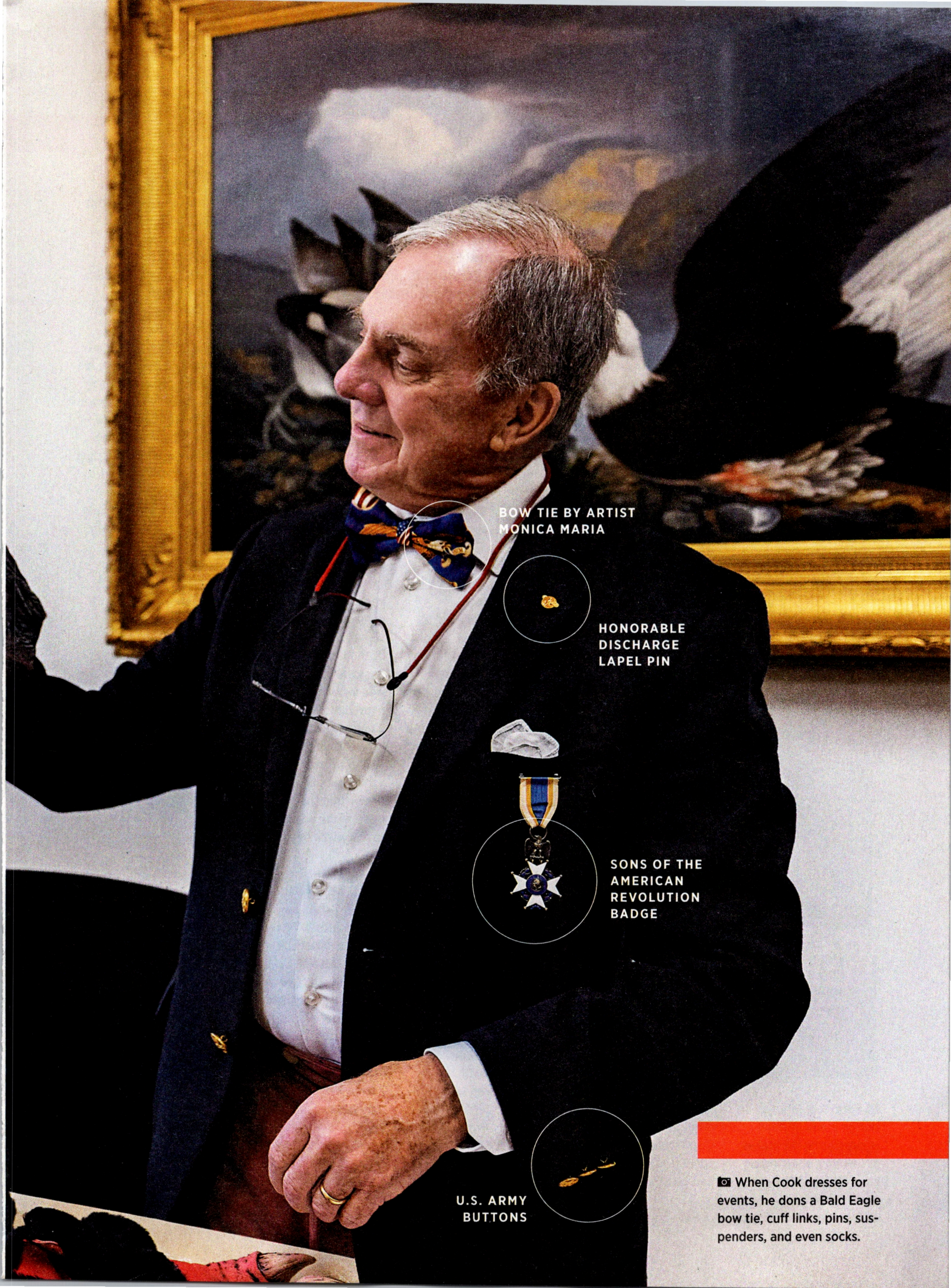
STAR FROM THE IRWIN MEMORIAL BLOOD BANK

You Can't Have Too Many Eagles

How one man's obsession with the Bald Eagle became a bid to finally win the bird the recognition it deserves.

BY JACK E. DAVIS

PHOTOGRAPHY BY JAIDA GREY EAGLE


BOW TIE BY ARTIST MONICA MARIA
HONORABLE DISCHARGE LAPEL PIN
SONS OF THE AMERICAN REVOLUTION BADGE
U.S. ARMY BUTTONS

When Cook dresses for events, he dons a Bald Eagle bow tie, cuff links, pins, suspenders, and even socks.

IN THE KEEN EVENING LIGHT, A BALD Eagle skirted the rushing current, dropped down within inches, and reached in for a fish. “It’s dinnertime,” said Preston Cook, watching from the patio of his condominium in Wabasha, Minnesota. It was early September 2020. Cook and I sat sipping bourbon as the Mississippi River sprinted past just feet away. On the Wisconsin side, a protected floodplain sheltered favorite Bald Eagle nesting trees—cottonwoods with sturdy, lookout-high branches.

The river never froze here and the fishing was always good. Eagles remained active year-round in sizable numbers, although some would begin migrating in a couple of months. Cook would leave, too. The eagles would fly south to Missouri or beyond to the Gulf Coast. Cook would drive west to San Francisco, where he and his wife, Donna, lived the other half of the year. Come April, he’d return, as would the birds. “I like being back here with the eagles,” he said.

> “You know, most people think the Bald Eagle is the national bird.”

Cook’s manner is polite and precise. Tall and fit, he is younger-looking than his 70-plus years, yet old enough to remember when the wanton degradation of the environment made seeing Bald Eagles in the wild an unlikely prospect. After a national moral reckoning with the natural world, their population staged a comeback for the ages. “The eagles I see out here tell me how well we’re doing together,” he said.

Cook reached for the bottle of Eagle Rare to freshen our glasses, each etched with a Bald Eagle. If Cook saw something with the handsome raptor on it, he had to have it. Over more than half a century, he has amassed a vast collection of eagle memorabilia—from medals, flags, and comic books to a life-size statue of Wonder Woman in her classic eagle bodice—some 40,000 items in all.

However tempting, comparing him to a crackpot hoarder would be a mistaken assumption. He keeps informational notes on nearly every item, including such gems as an authenticated document signed by Abraham Lincoln and hand-painted plates produced from engravings for John James Audubon’s seminal work, *The Birds of America*.

He also uses his obsessive pursuit to serve the public good. Cook is the type to see our half-empty bottle of bourbon as half full, and he feels hopeful about the Bald Eagle’s future. Yet as two alpha species—humans and eagles—expand their domain, he recognizes the odds of renewed conflict. Contemplating that possibility, Cook envisions his collection inspiring empathy for the bird’s continued prosperity. That’s why he was in Wabasha.

Minnesota has the largest nesting population of Bald Eagles in the contiguous United States, and Wabasha is situated along a migratory flyway in prime eagle habitat. The riverfront town of roughly 2,500 people is also home to the National Eagle Center, which hosts programming and exhibits on the biology of Bald Eagles, assisted by non-releasable feathered ambassadors: Angel, Was’aka, Perseus, and Latsch. Cook moved across the country so that his cultural artifacts might enrich visitors’ experiences with the live birds.

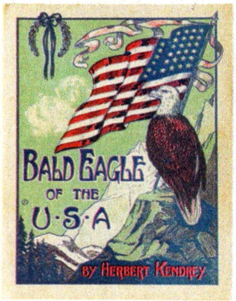
I was writing a book on the Bald Eagle and had come to Wabasha at Cook’s invitation to explore his collection. It’s a repository of a complicated, nearly 250-year history in which we ultimately had to save the Bald Eagle from ourselves—our guns, chemicals, and other destructive propensities. We had done that, but Cook believed there was a gap in the history that needed to be closed to fully reconcile our relationship with our avian associate.

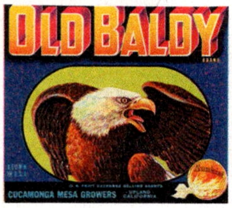
“You know, most people think the Bald Eagle is the national bird,” he said, corking the bottle. Books, newspapers, and plenty of experts made that claim. Even government websites asserted as much. “But they’re wrong.” We both knew that no Congress or president had ever bestowed the honor on a species, and neither of us was aware of any efforts to correct this longstanding oversight. We had a national mammal, the bison; a national tree, the oak; and a national flower, the rose. Surely the Bald Eagle merited the same level of recognition. A congressional vote, we agreed, could usher in a palliative moment of bipartisanship at a time when the nation was deeply divided. “We need this,” Cook insisted. And I knew he wasn’t a person to lose sight of a goal.

COOK GREW UP IN A MIDDLE-CLASS FAMILY of five in Evanston, Illinois. In May 1966, when he was 19, he and a friend went to see the film *A Thousand Clowns*. Cook had just spent 13 months hitchhiking across Europe, North Africa, and the Middle East, and much had inspired him. But what changed his life was a single line that the movie’s main character, Murray Burns, utters when his 10-year-old nephew complains after he buys an eagle ornament he can scarcely afford. “Nick,” Burns explains, “you can’t have too many eagles.” That struck a chord with Cook, who had a natural inclination for collecting but lacked a focus. After the movie, he resolved to start collecting eagle objects.

The first were issued to him five months later when he was drafted into the army. His dress uniform bore brass buttons stamped with the Bald Eagle on the Great Seal of the United States. When his hitch was up in 1968, he cut them off and started his collection. He began adding prints, pins, statues,

Extinct Species
are
NOT BORN
AGAIN





From top: Pinback button made in 1982, underscoring the stakes of inaction; sheet music circa 1913; a 1950s-era citrus brand label, named after Mount San Antonio.

military medals, and postcards he picked up at flea markets, garage sales, and antique shops.

Unlike Burns, Cook had built a successful commercial real estate business and could afford his passion. Sometime in the 1990s, he took his searches to the internet: "Thousands of items filled my screen," he says, "and the deluge commenced." He began averaging 2,000 purchases a year.

When I visited his condominium, the walls of the entrance hallway displayed eagle-related movie posters, World War I broadsides, and a Newark Eagles jersey signed by Negro Leagues' pitching ace Leon Day. Others held engravings by 19th-century ornithologist John Gould and 18th-century naturalist Mark Catesby. Commanding atop the fireplace mantle was Liberty Eagle, a peculiar, 40-inch-tall ceramic sculpture that stood humanlike, wearing a cascading red-and-white-striped skirt and a blue-and-white star-spangled brassiere.

"Yes, you *can* have too many eagles," Donna told him as his acquisitions grew. Preston agreed to an "eagle-free zone." "The bedroom," he told me, "remains off limits."

No such zone existed at the old American Legion Hall in Wabasha, where I first encountered the collection. Five years after an 18-wheeler hauled it up from California, its 40,000 items crowding 4,000 square feet brought to mind Lucretius's resonant phrase: "Numbers in number beyond number." I couldn't see the walls for all that hung on them. Tight pathways wriggled past dozens of tobacco canisters, hundreds of cups and plates, thousands of campaign pins, countless postcards, and the largest privately owned eagle stamp collection. There were belts, buckles, boots, brooches, walking canes, and a slot machine. There were guns, knives, cigarette lighters, cowboy boots, and 54 hood ornaments, dust-free and gleaming. Cook had even installed stylized toilet seats in the restrooms, painted with white feathered heads and yellow eyes staring up at you. All these objects were the embodiment of not only Cook's fixation but also a nation's.

CAPITAL CITY
POLICE
EAGLE COUNTY
AMBULANCE DISTRICT
SECURITY AGENCY
UNITED STATES OF AMERICA
POLICE
MORRIS TOWNSHIP N.J.

From top: A replica of a Central Park statue sits in front of the National Eagle Center, where an exhibit includes patches worn by first responders and rhinestone stilettos.

WHEN THE CONTINENTAL CONGRESS adopted the Great Seal in 1782, featuring a Bald Eagle clutching objects of peace and war, the species achieved a high perch in national iconography. *Haliaeetus leucocephalus* lives only in North America, and to the people of a young republic, the stalwart raptor exhibited strength, courage, and most importantly freedom. Its mesmeric bearing made it a favored cultural and patriotic symbol, appearing on flagstaffs, military insignia, U.S. currency, business logos, chinaware, and eventually bumper stickers, tote bags, motorcycle jackets, and of course bourbon bottles.

History is not without paradox, however. While Americans idolized the emblematic Bald Eagle, they loathed the living bird. They sought to eradicate the formidably taloned raptor for preying on livestock and commercial fish. By the time Congress passed the Bald Eagle Protection Act of 1940, the population was spiraling toward the same fate as the extinct Passenger Pigeon. Five years later, DDT went on the open market.

The year Cook saw *A Thousand Clowns*, there weren't a thousand pairs of Bald Eagles nesting in the Lower 48. Despite Rachel Carson's warning in *Silent Spring* about DDT's deadly climb up the food chain, the industry-vaunted pesticide was still widely used. Simultaneously, the postwar population boom consumed great swaths of wilderness, and runoff polluted two-thirds of the nation's waters.

PHOTO: PETER MATHER

Bounty on the Brink

In the Chilkat River Valley, residents sound an alarm over threats to Bald Eagles and their own way of life.

FOR SHAWNA HOTCH, IT'S NO MYSTERY WHY Alaska's Chilkat River Valley hosts around 4,000 Bald Eagles each fall. The birds are drawn to the same unparalleled natural wealth—copious salmon, lush spruce forests, pristine glacier water—that has supported her family for countless generations. "Our way of life is directly tied to this land and all that it provides," says Hotch, a resident and an enrolled member of the Chilkat Indian Village of Klukwan. "It's abundant."

The immense eagle congregation inspired Audubon to help establish the Chilkat Bald Eagle Preserve in 1982, and an analysis by Audubon scientists last year found that the Chilkat is a globally significant region for 17 more bird species. All contribute to the deeply interconnected web of life that defines the valley, one of the most biodiverse regions in Alaska. But Hotch warns that this interdependence also makes the ecosystem fragile: "You change one thing, you change everything." And a big change may be on the way.

A mining company has proposed drilling a mile-long exploratory tunnel into a mountain to access potential deposits of copper, silver, zinc, and gold—construction that could release sulfuric acid and heavy metals into the watershed. If that happens, there's no going back: Even trace amounts of toxins could prevent salmon, whose life cycle nourishes the valley, from spawning, which would devastate the ecosystem.

It would also imperil the economy and character of the region. "I just don't know what life would be like without salmon," says Natalie Dawson, a resident of Haines. Eagles, too, play a vital role: Birders flock to the Chilkat Bald Eagle Preserve, the Alaska Bald Eagle Festival, and the Southeast Alaska Birding Trail, boosting local businesses.

According to the company leading the project, the current phase of advanced exploration will continue for at least another three to five years as it weighs whether to pursue a full-scale mine. Faced with enough pressure, state and federal agencies could step in to establish or reinforce protections—including under the Bald and Golden Eagle Protection Act—says Dawson, who fought for greater transparency around the mine proposal as a borough assemblywoman.

The Chilkat Indian Village, in the meantime, is already taking action. The village recently launched Chilkat Forever, a campaign to uplift community voices and preserve its way of life. "Klukwan is a people and a place," Hotch says. "You can't separate us from our land. We've been stewards of the Chilkat land forever." *—Benjamin Hack*

After 20 million people rallied on the first Earth Day in April 1970, Washington adopted a series of landmark initiatives. In 1972, the newly established Environmental Protection Agency banned the domestic sale of DDT, and Congress passed the Clean Water Act. The following year, a revamped Endangered Species Act became law, with its flagship ward, the Bald Eagle, proclaiming its virtue. On the nation's bicentennial, wildlife biologists introduced restoration programs that yielded impressive returns. In revitalized waters, aquatic vegetation returned. Fish and fish-eating mammals returned. Ospreys and pelicans, hit hard by DDT, returned. By the late 1990s, Bald Eagles returned, too.

Cook, then in his 50s, was struck by the irony that he had never seen a Bald Eagle in the wild. So he traveled to Alaska—where the population had remained stable despite DDT—for the annual festival at the Chilkat Bald Eagle Preserve. The preserve was known for hosting what's believed to be the largest convocation of Bald Eagles in the world; still, he was stunned to see thousands of them.

Back in California, Cook's newfound appreciation for the species moved him to expand the collection beyond symbolic representations. He acquired ornithological texts, artwork by Roger Tory Peterson and Louis Agassiz Fuertes, and a complete set of Audubon's double-elephant eagle prints. He purchased hundreds of photographs of eagles, raptor centers, and restoration-era hack towers for releasing captive-bred birds. Ultimately, his library held around 2,000 eagle-related books.

Cook's growing interest in the living bird also led him to join the boards of Point Reyes Bird Observatory (now Point Blue Conservation Science), near San Francisco, and the American Bald Eagle Foundation, host of the Chilkat festival, in Alaska. When he returned to the event in 2003, he won an auction to release a rehabilitated eagle. The bird's weight and talon grip on his ungloved forearm and the burst of air from its wings left him awestruck. Later, someone told Cook that he had stood motionless with his arm raised long after the eagle lifted skyward.

This time he returned home determined to share his life's labor with others, hoping they would find their own connections to nature. The collection, he believed, would have the greatest impact if displayed where visitors would see and learn about live birds. That's when he discovered the National Eagle Center in Wabasha. Although it operated out of an old retail store and barroom, visitors could see 50 or more eagles in the winter months a block away at the river, where the center was preparing to break ground on a 14,000-square-foot facility. It would feature an auditorium, classrooms, a glass-encased aviary, and a spacious outdoor observation deck. Cook knew he had found a home for his collection. "It's so unique and important," board member John Wodele told me. "We felt excited and privileged he chose us."

Three months before the opening in September 2007, the U.S. Fish and Wildlife Service delisted the Bald Eagle. With 11,040 breeding pairs across the Lower 48, the Bald Eagle had become the Endangered Species Act's first major success story. Some

A photo of Cook releasing a rehabilitated Bald Eagle in the Chilkat River Valley captures a moment that shaped his collection's trajectory.

150 pairs nested around Wabasha, scores in those riverside cottonwoods, up from a single pair in the year Cook cut the buttons off his uniform.

AS IMPRESSIVE AS THE NEW CENTER WAS, needs had changed. Cook's gift included a request for a full-time curator and expanded gallery space for exhibiting items pulled from storage, which he relocated to two buildings he bought on Main Street. To fund the improvements, the board launched a capital campaign emphasizing Cook's collection. Schoolchildren joined Angel, the center's senior eagle ambassador, on a trip to the capitol in St. Paul to help secure $8 million in state bonding funds.

Cook was struck by the irony that he had never seen a Bald Eagle in the wild.

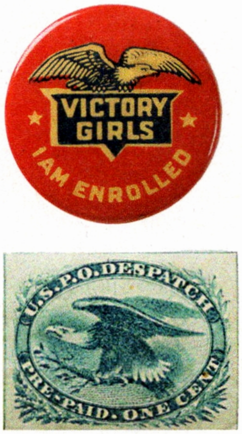
One of the largest private donors, pledging $1 million, was the Prairie Island Indian Community, located 40 miles upriver. The tribe was particularly interested in upgrading the center's avian-care facility, which Cook had also made a condition of his donation. "For our tribe and culture, the eagle has special meaning," Tribal Council President Shelley Buck told the *Minnesota Star Tribune,* as a sacred messenger between the people and the Creator.

By the time the expansion was completed in 2022, the tenacious raptors had pushed their numbers up to more than 316,000 birds in the Lower 48 and an estimated 500,000 continent-wide. The comeback was a tour de force, creating an opportunity to teach about the birds and the benefits of living peaceably with nature. Just as the proliferation of nest cams early in the 21st century invited millions into the intimate world of Bald Eagle families, Cook's eagle artifacts introduced people to the deep historical and ecological connections between humans and the bird. The history of one was inseparable from the other, and the well-being of both was tied to the health of a shared environment. As Al Batt, a board member of the American Bald Eagle Foundation, sees it, by combining live eagles and natural history with Cook's exhibits, the center facilitates an understanding of the importance of "leaving the world a better place" for future generations.

Former center CEO Meg Gammage-Tucker says an invaluable attribute of the collection is the many narratives that appeal to a cross-section of visitors and inspire an appreciation of wildlife conservation. There is something for just about everybody: recreational hunters, scouts, liberals, conservatives, environmentalists, Native people, and others. When she was director, no group touched her more than the veterans who, after inspecting the uniform of a full colonel (known as a bird colonel) bearing 15 eagle insignias, looked at the live eagles and said, in her words, "This is the symbol for what I did for the country."

SOON AFTER OUR EVENING SPENT SIPPING bourbon, Cook committed himself to making the Bald Eagle the national bird. He had reached out to Senator Dianne Feinstein a decade earlier, asking for clarification about the bird's official status. She confirmed that no legislation designated it as such, but felt the Great Seal "effectively" validated its standing. No longer satisfied with that

Continued on page 54



From top: Pinback button equating eagles with patriotism during World War II; U.S. Post Office "eagle carrier" stamp issued in 1851.

FIELD GUIDE

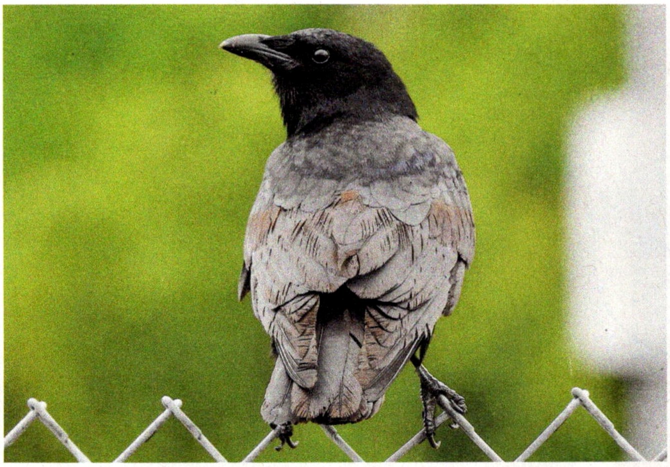
Head out for corvids and conifers, or stay in to dream big for the new year.

INSIGHT

Meet the Neighbors

Get the inside scoop on the drama-filled lives of your local crows.

Winter roosts can swell to more than a million crows.



A young crow sports a telling mix of older brown and fresh black feathers.

AS THE WINTER CHILL SETS IN, AMERICAN Crows start congregating. A crowd of corvids can seem intimidating, even ominous. And for those who live close to a roost, the birds can be a noisy and messy nuisance.

But take a closer look, and you might start to think differently. "Crows are really, really social," says Anne B. Clark, a behavioral ecologist at Binghamton University. Crows form sophisticated multigenerational societies, with family units of up to 15 birds including a breeding pair, mischievous one-year-olds, older siblings, and extended relatives. Together they find food, defend their territory, and raise young. There are many delights for the aspiring crow-watcher, as every caw, flap, and feather ruffle reveals how smart and adaptable these birds are.

The crow's social-butterfly lifestyle is on display during the coldest months, when family groups do the most mingling with their neighbors. This makes winter a great time to start your crow-watching journey. During the day, look for small loose flocks, often made up of younger birds following older ones to forage. By late afternoon, the corvids will start returning to their roosts high in the trees, where they gather in large numbers to socialize and sleep. In late winter, communal roosts can host hundreds, thousands, or even more than a million crows. They offer boundless entertainment: Watch for squabbles between feuding families and for young birds interacting—perhaps the blossoming of a friendship or courtship.

The youngest crows, hatched the previous spring, can be especially exciting to observe in winter. This social time is important to their early development. "Crows take a relatively long time to grow up," says Clark. The corvids usually do not start families of their own until they're a few years old, so spending time in large winter flocks and interacting with other birds help youngsters avoid predators—there's safety in numbers—while learning skills like where to find the best food sources. They also build bonds that will one day help them establish territories and families of their own.

As winter turns to spring, communal roosts disperse into individual families, but the joys of crow-watching continue through the year. Breeding season brings fights between males to court a female, and by late March nest construction will be underway in the treetops. Watch closely to see if you can spot yearlings in the mix: Look for a sharp color contrast in their wings between newer, blue-black feathers and older, brownish ones. Visibly unkempt feathers, especially a ragged tail edge, also indicate a yearling. These older siblings and other helpers might bring food to the brooding mother or to nestlings. Typically out of the nest by June, fledglings are the same size as adult crows but often even scruffier than yearlings; they're distinguished by a yellow or pinkish tinge to the skin at the edges of their bills, as well as by their blue eyes (adults' eyes are dark). You might see them chasing older crows and begging for food, bright pink mouths agape. Come September, if you hear a crow making strange noises, it's likely a fledgling practicing its caw.

"I think what a lot of people find so fascinating is they can really relate to what crows do," Clark says. Crows have homes, share knowledge, and establish communities, and researchers are just beginning to understand their complex social behavior and personalities. So whether you live in the city or a more secluded place, consider the crow. There's still much to be discovered. —*Alice Sun*

PHOTOS FROM LEFT: RAHUL LAL/SIPA USA VIA AP IMAGES; LAURA MAE; BILL GOZANSKY/ALAMY

ID CHALLENGE

Double Take

Are you sure that's not a Fish Crow?

LOVE THEM OR NOT (YET!), EVERYone knows crows. But in the eastern United States, particularly near the coast, think twice before adding to your checklist. Two crow species call the region home, and telling them apart is exceptionally tricky. Enter the Fish Crow.

From its core range amid the beaches and wetlands of the Southeast, the Fish Crow has spread far inland along rivers and up the East Coast all the way to Maine. A generalist despite the name, it eats everything from crabs to carrion to fruit and grains. The eggs and nestlings of other birds, especially herons, are a favorite meal. Like the American Crow, the Fish Crow does well in developed landscapes. In winter you might spot them in less than picturesque settings, like near malls and landfills.

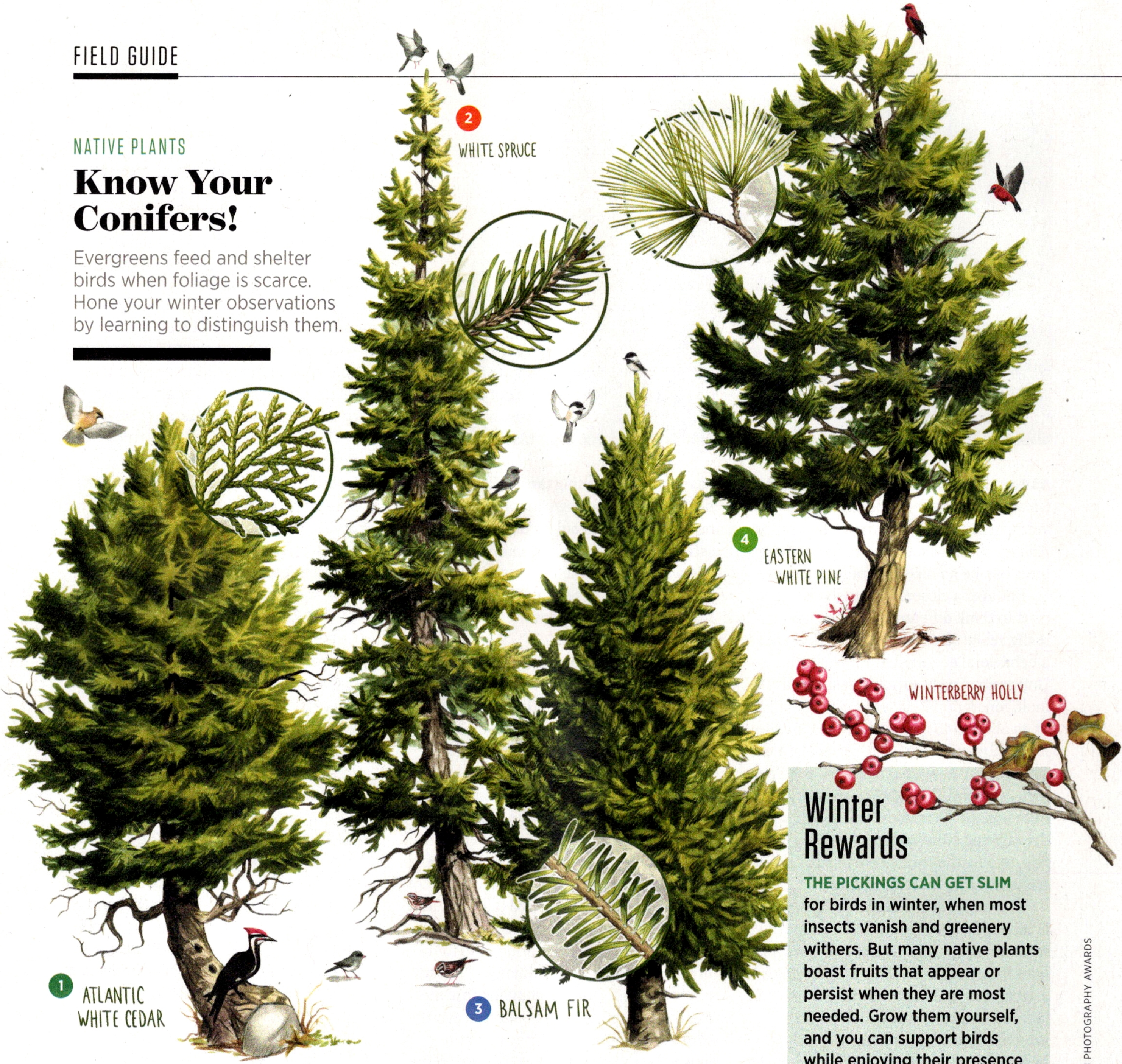
Winter is the pinnacle of social life for Fish Crows, as it is for their American Crow cousins. The two species may even forage and roost together—making identification even tougher. The Fish Crow is smaller, but for your best shot at telling them apart, listen.

Like other corvids, the Fish Crow makes many sounds. But its unmistakable signature is a nasally doubled call—*uh oh* or *uh uh*—that some say sounds like an American Crow with a head cold. When in doubt, try asking the bird: "Are you an American Crow?" If it's a Fish Crow, it will disagree: *Uh uh!* —*Zoe Grueskin*

NATIVE PLANTS

Know Your Conifers!

Evergreens feed and shelter birds when foliage is scarce. Hone your winter observations by learning to distinguish them.



1 CEDAR

Instead of needles, it helps to remember that North America's native "cedars" (actually cypresses) have ***scaly*** leaves. Birds consume the trees' cones and resident insects, like carpenter ants. **Who loves them:** Cedar Waxwing, Golden-crowned Kinglet, Pileated Woodpecker

2 SPRUCE

Handle with care; spruce needles are ***stiff and spiky***. But with a distinctive four-sided, or square, shape, they will roll easily between your fingers, unlike other conifer needles. Many birds seek spruces' nutrient-dense seeds. **Who loves them:** Evening Grosbeak, Fox Sparrow, Dark-eyed Junco

3 FIR

Fir needles are ***flat, flexible***, and "friendly." Look closely to admire a unique feature: Each needle attaches to the branch with a base that resembles a suction cup. Dense branches offer a safe perch for birds. **Who loves them:** Red-breasted Nuthatch, Black-capped Chickadee, Spotted Owl

4 PINE

A surefire way to tell if you're looking at a pine tree is to check its needles, which grow in clusters or "***packets***," usually in groups of two, three, or five. Some birds open cones to eat the seeds, and many species nest in pines. **Who loves them:** Clark's Nutcracker, Calliope Hummingbird, Red Crossbill

Winter Rewards

THE PICKINGS CAN GET SLIM for birds in winter, when most insects vanish and greenery withers. But many native plants boast fruits that appear or persist when they are most needed. Grow them yourself, and you can support birds while enjoying their presence from the comforts of your home. Trees like mountain ash and eastern juniper need space, while compact varieties of shrubs like winterberry can be grown in pots on a porch or stoop. Vines are another option; the berries of plants like Virginia creeper and trumpet honeysuckle can hang on through winter, a boon to hungry birds. Find the right plants for where you live with Audubon's Native Plants Database at audubon.org/plantsforbirds. *—Z.G.*

PHOTOS FROM LEFT: SCOTT SURIANO; SNAIL KITE, COREY RAFFEL/AUDUBON PHOTOGRAPHY AWARDS

BEHIND THE SHOT

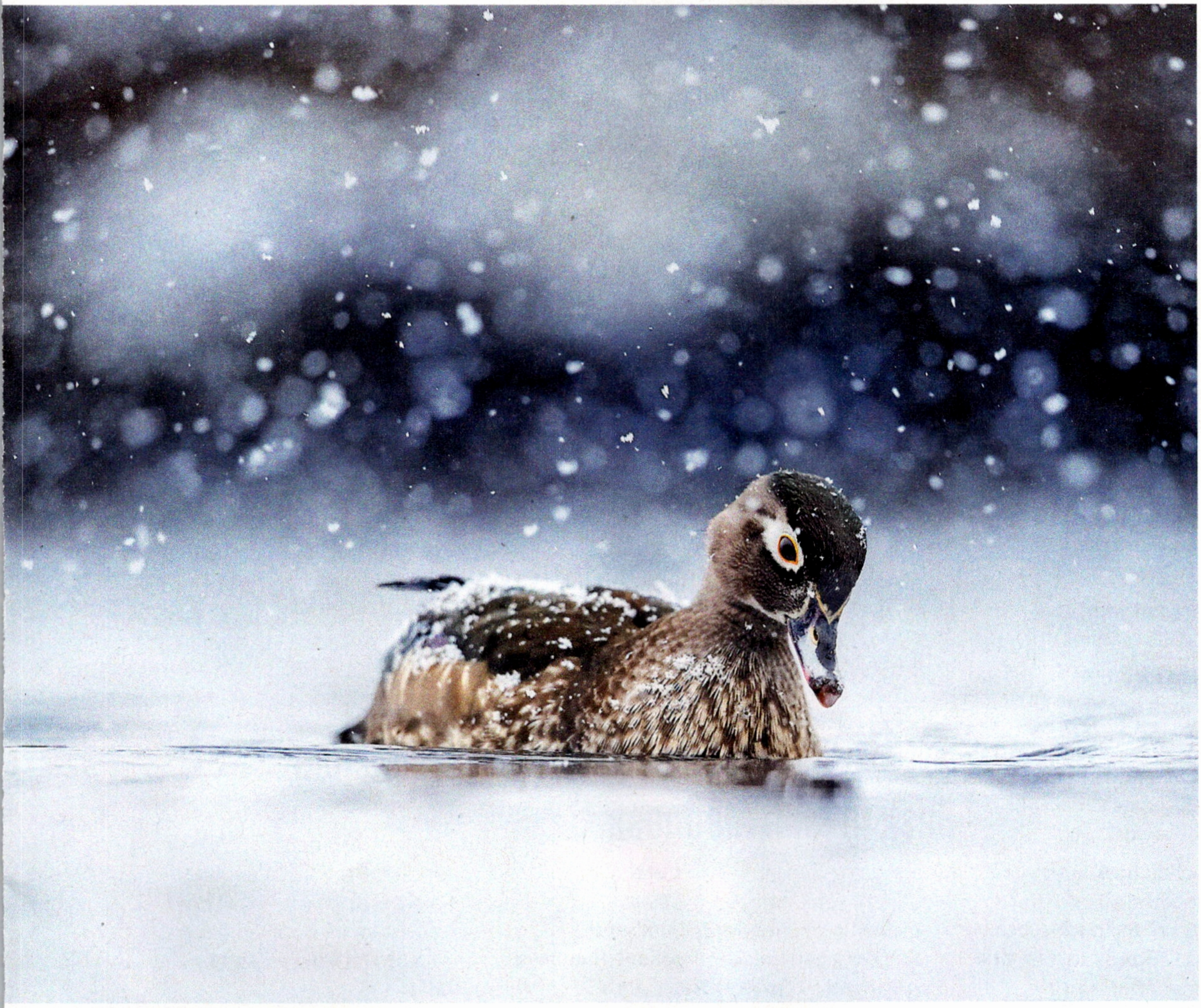
Cold Plunge

Unseasonable weather can be a gift for the ready photographer.

PHOTOGRAPHER SCOTT SURIANO IS always hoping for one last snow. In the mercurial transition from winter to spring, he sees a chance to capture an unusual scene: Wood Ducks in a flurry of snowflakes. His window of opportunity each year is brief, as the ducks return to the pond near his home in northern Maryland only in late February or early March. Once they've arrived, he checks the forecast each night, hoping for inclement weather. On the morning he photographed this female, Suriano woke before dawn to falling snow. "It was coming down pretty heavy," he says, "so I thought I'd give it a shot."

Rather than lying prone on the pond's edge, which grows uncomfortable, Suriano prefers to get into the water. An icy dip is no problem for Wood Ducks—insulated with fat and down beneath waterproof, oil-coated feathers—but Suriano's immersive approach requires the right gear. In below-freezing temperatures, he dons midweight waders with room for extra layers underneath that keep him warm and dry. Equally important is the floating blind he uses to avoid startling the birds, which he fashioned from marine-grade plywood and a cheap foam recreational bodyboard. The setup has a photographic advantage, too: "It allows you to get a really low, surface-level shot."

Once he's in the pond, ideally before sunrise, it's a waiting game. The Wood Ducks fly down to the water from their roosts in the trees, usually swimming in breeding pairs. This female's flashier mate was likely just out of frame, Suriano says; he opted to give her center stage instead. To accentuate the ethereal wintry atmosphere, Suriano adjusted his camera settings to produce a bright image with a very thin depth of field, capturing the duck's subtly hued head in crisp focus while casting most of the falling snowflakes in a dreamy blur. "The subject is the duck," Suriano says. "But the supporting cast is the environment and the weather." *—Z.G.*



Eye for Detail

RATHER STAY snug indoors? Spend the day perusing photos you've already taken for metal or brightly colored plastic rings around a bird's ankle or neck. Easiest to spot on large species, these bands are a low-tech yet effective way to track a bird's movements. If you find one visit reportband.gov to share your sighting with the federal Bird Banding Laboratory. Your contribution adds to more than a century of data, which scientists use to study migration and breeding, monitor disease, and assess impacts of climate change. You will receive a certificate of appreciation detailing when and where the bird was banded if the lab is able to match your report to its records—and you never have to leave the fireside. *—Z.G.*

RESOLUTIONS

A Year of Avian Action

Follow *Audubon*'s monthly challenges to grow as a birder—and a bird advocate—throughout the seasons.

JANUARY

Get Bird-Ready

Gear up for 2025 with bird-friendly housekeeping. Add window decals or screens to prevent strikes. Got a feeder? Clean it out. Got a yard? Stack branches to build a brush pile.

FEBRUARY

Listen Up

Use the winter quiet to learn songs and calls of year-round residents, which will help you notice when visitors add their voices. Then, apply your neighborly knowledge to the Great Backyard Bird Count.

MARCH

Seed Local Growth

Native plants provide nectar, berries, seeds, and bugs that fuel birds throughout the year. To support your local food web, use Audubon's Native Plants Database to prep for spring planting, or volunteer at a nearby park to pull up invasives.

APRIL

Be a Patch Pro

Go deep by picking a local spot to bird every week this month.

WEEK ONE: Walk around your patch. Draw a map of its features.

WEEK TWO: Settle in for a bird sit. Spend 15 minutes in one spot and deeply engage your senses.

WEEK THREE: Visit at a new time of day. What differences do you notice in bird behavior?

WEEK FOUR: Reflect on how your patch has changed since your first visit. Keep coming back to spot shifts across seasons.

MAY

Put Female Birds First

Overcome birding's bias toward often-flashier males by dedicating a day to look for female birds. Noting subtle markings and behavior can help nail these trickier IDs—and make you a sharper birder.

JUNE

Peep Family Antics

Now's the time to spy on new bird families (from a respectful distance). To find a nest, check birds' beaks for deliveries: Some will be carrying nesting material or shuttling food to their young. Try to spot a juvenile looking fluffy or oddly proportioned.

JULY

Share the Shore

At a beach? Leave room for shorebirds' sandy nests and waterfront foraging. Volunteer with a coastal bird stewardship program or start your own to spread the word.

AUGUST

Bask in Molt Madness

Find a scraggly, patchy bird in the process of refreshing its feathers. Waterfowl and large birds in flight are good targets to spot feather gaps. (Just be sure not to judge.)

SEPTEMBER

Refresh Your Fall

As migration gets underway, challenge yourself to try something new. Fill in your personal birding goals below, then check back in at the end of the month to see how you did.

One new species I want to look for: ____________

One new person I want to bird with: ____________

One new location I want to check out: ____________

One new birding approach I want to try: ____________

OCTOBER

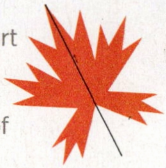
Hit a Hawk Watch

Take in the majesty of raptors soaring through fall migration. Find a nearby watch at hawkcount.org, and keep an eye on silhouettes and flight patterns to sharpen long-distance IDs.

NOVEMBER

Practice the Art of Observation

Try sketching birds in the field. Start by capturing posture and shape, then fill in feather groupings and key details. No matter your level of artistic skill, the practice can help you observe birdlife with fresh eyes.



DECEMBER

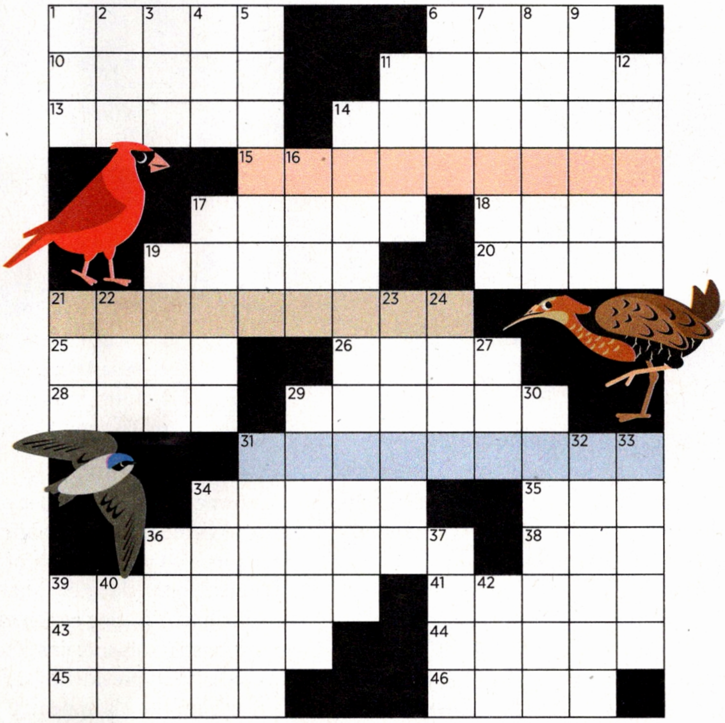
Boost Science

Each year, the Christmas Bird Count creates a global snapshot of avian populations. Find a count at audubon.org/cbc to add your local birdlife, and check zooniverse.org for more ways to help scientists from home. —*Maddie Burakoff*

FUN & GAMES

In the Wings

Keep an eye out for vagrant clues as you unwind with our avian-themed crossword. *—Jasper Davidoff*



ACROSS

1. Like the compounds in table salt
6. Vegan gelatin alternative
10. Film effect that can show a hummingbird's wings beating
11. Not accepting customers
13. Green, Gray, or Little Blue wader
14. Makes it to the big leagues
15. One might point toward a pole
17. Bird that migrates without a set route
18. Guthrie who sings "Little Bird"
19. Inflate, as a bike tire
20. Foil-wrapped Hanukkah treat
21. Service offered by Amtrak's Acela
25. Suggestion
26. Setting for a chicken or ostrich
28. Bird that went extinct in the 1600s
29. *The Wind in the Willows* protagonist
31. Admit to a bird ID mistake, e.g.
34. Cruz known as the "Queen of Salsa"
35. Droop
36. 2024 *Dune* film subtitle
38. Call a Herring Gull a seagull, say
39. Literary sisters Anne, Charlotte, and Emily
41. No longer roosting
43. McDonald of fast-food mascothood
44. Restore to factory settings
45. Stop from developing, as a goose egg
46. Spotted

DOWN

1. Sorta
2. Chant at a FIFA match
3. "Neither snow ___ rain..."
4. "Here's what I think," over text
5. Southwestern U.S. scavengers
6. Baldwin on *30 Rock*
7. Attend on one's own
8. Set ambitious Big Year goals, say
9. Throw the dice again
11. Mixed-gender
12. "I forbid you!"
14. Citrus crops enjoyed by orioles and catbirds
16. "No need to get me out of bed!"
17. "Hello!" in Shanghai
19. Reached adult plumage
21. Concealed oneself from a predator
22. Statement at an altar
23. Abstain from cooked foods
24. Plummet to snatch lower-flying prey
27. Deface
29. Shed one's feathers
30. Avian flu or parrot fever, e.g.
31. Title turtle in a Dr. Seuss book
32. Make dimmer
33. The Audubon logo is a Great one!
34. Artificial waterway that might host ducks or coots
36. Urban spot for birds to bathe
37. They're useful for a canoe race
39. Bikini top
40. Human's fishing tool
42. Undersized

Check your work at ***audubon.org/wingspuzzle****.*

TAKE IT FROM ME

See Birding As a Puzzle

When the birding gets tough, start looking for clues.

DURING ONE OF MY FIRST OUTINGS with the Alachua Audubon Society in Gainesville, Florida, we paused to watch a flock of vultures circling. Some were Turkey Vultures, a leader explained, and others Black Vultures. I trained my binoculars to the sky—first in excitement, then defeat. How were the tiny distinctions in head shape and flapping frequency so clear for others? Could I ever figure this out for myself?

These feelings were familiar. A few years earlier, I dove into the world of crossword puzzles, and at first was bewildered by tricky wordplay and tough references: 19th-century philosophers, plant genera, classic television. But with practice, I picked up skills that helped me fill in the blanks, applying detective work that's made me a better birder as well.

The more time I've spent on my hobbies, the better I have gotten at spotting both common crossword entries and familiar birds. When I come across a head-scratcher, I take my time and use patterns to decipher the answer. Other times, I will turn to fellow enthusiasts. I have never met a veteran birder or a seasoned crossword buff who wasn't delighted to share what they knew.

So on your next walk or ramble, try seeing tricky IDs as a puzzle, not a problem. And if you find a five-letter feathered friend in your crossword, it's probably an egret. *—Matthew Stock*

ILLUSTRATIONS: EMILY RENAUD/AUDUBON

BALD EAGLE Continued from page 47

Cook admires postal cover art hand-painted by Dorothy Knapp—among the many gems still in storage.

explanation, Cook took the idea of launching a campaign to Gammage-Tucker. She offered the National Eagle Center as the institutional home of an effort they named the National Bird Initiative. Wodele and I came aboard to co-chair it with Cook.

Cook found a useful model in the effort that persuaded Congress to name the American bison the national mammal in 2016, arguing that it was a species of significant cultural, economic, and ecological value that had returned from the brink of extinction. For the Bald Eagle, national bird designation would be a rightful honor and capstone for the protection of a species that survived centuries of persecution while ably symbolizing the nation.

Cook drafted a "very simple" bill, linking the Bald Eagle to national identity, Indigenous spirituality, and the country's history. He then funded a lobbyist, who secured endorsements from zoos, wildlife organizations, Alaskan Native villages, and veterans groups. An early endorsement came from the Midwest Alliance of Sovereign Tribes, currently representing nearly 134,000 tribal members. Its executive director, Scott Vele, praised the initiative as a gesture of "respect" for the "oldest and bravest animal," giving "acknowledgment to our ancestors, our brothers, our sisters, our life."

Gammage-Tucker reached out to U.S. Senator Amy Klobuchar, a Democrat, and Congressman Brad Finstad, a Republican, both of Minnesota, about sponsoring a bill. After touring the center with Gammage-Tucker and Cook, Finstad said he'd gladly assist. Klobuchar, a longtime supporter of the center, signed on as co-sponsor, as did Republican Senator Cynthia Lummis of Wyoming. "For more than 240 years," Lummis said, "the Bald Eagle has been synonymous with American values."

In Congress, the winged exemplar of national virtue and conservation achievement appealed to both sides of the aisle. The Senate passed the bill unanimously this past July, effecting a moment of welcome bipartisanship against the backdrop of a contentious presidential campaign. As of press time, the bill appeared poised to sail through the House of Representatives and to the president's desk.

The bill's passage would be timely. It comes as Bald Eagles are contending with mounting risks, perhaps the greatest since Cook began his collection 50 years ago. The population is feeling the effects of habitat loss, car strikes, powerline electrocutions, and toxins that pass up the food chain. A 2022 study found that nearly half of 1,210 eagles tested across 38 states exhibited signs of acute lead poisoning. Climate change looms large, too. Warming and rising waters will likely diminish fish stocks and habitat and heighten competition among species. Extreme weather events, such as hurricanes, are already killing birds and destroying nests.

Cook's collection strikes at the heart of our complicated relationship with the Bald Eagle, illuminating the duality of human nature—our virtues and our flaws—in the shared world of this remarkable bird. Yet from this history emerges hope. It reveals our potential to rise above our failings and the eagle's steadfastness in enduring them, reaffirming its merit as a flagship species of both nature and nation. Ⓐ

JACK E. DAVIS *is an environmental historian at the University of Florida and the author of* The Bald Eagle: The Improbable Journey of America's Bird. **JAIDA GREY EAGLE** *is an Oglala Lakota freelance documentary photographer based in St. Paul, Minnesota.*

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f. Total Distribution		394,548	398,680
g. Copies not Distributed		2,100	2,128
h. Total		396,648	400,808
i. Percent Paid		99.62%	99.63%
16. Electronic Copy Circulation			
a. Paid Electronic Copies		65	47
b. Total Paid Print + Paid Electronic Copies		393,114	397,263
c. Total Print Distribution + Paid Electronic Copies		394,613	398,727
Percent Paid (Both Print & Electronic Copies)		99%	99%

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PHOTO: JAIDA GREY EAGLE

CALL FOR ENTRIES

2025 AUDUBON PHOTOGRAPHY AWARDS

Now with new prizes and a hemispheric wingspan!

Blackburnian Warblers. Photo: Mathew Malwitz, 2024 Grand Prize Winner

TAKE YOUR BEST SHOT!

Enter the Audubon Photography Awards. You could win cash prizes and see your photo published in *Audubon* magazine.

CONTEST ENTRY DATES

January 15–March 5, 2025

PRIZE CATEGORIES

Grand, Youth, Birds in Landscapes, Plants for Birds, Female Bird, Video, Birds Without Borders, and more.

AWARDS INCLUDE

Up to $5,000, a feature in *Audubon* magazine, and a special youth trip to Hog Island Audubon Camp.

▶ NEW FOR 2025

Additional chances for your photos to shine! We're putting migratory species and conservation in focus.

Plus, the contest will be migrating south to Chile and Colombia, where residents can win prizes for showcasing birdlife in essential ecosystems across the Americas.

AUDUBONPHOTOAWARDS.ORG

NO PURCHASE NECESSARY. Contest begins 01/15/25 and ends 03/05/25. Must be at least 13 years of age and a legal resident of the 50 United States, D.C., or Canada (excluding Quebec), or at least 13 years of age and a legal resident of Chile or Colombia, to enter the North and South American contests respectively. Parents or legal guardians must authorize entries for youth under the age of majority. Subject to Official Rules, which will be posted 01/15/25 on audubon.org. Void where prohibited.

Where birds inspire art, awe, and action

BAR-TAILED GODWIT DECORATIVE DECOY BY DAVID PERSONIUS

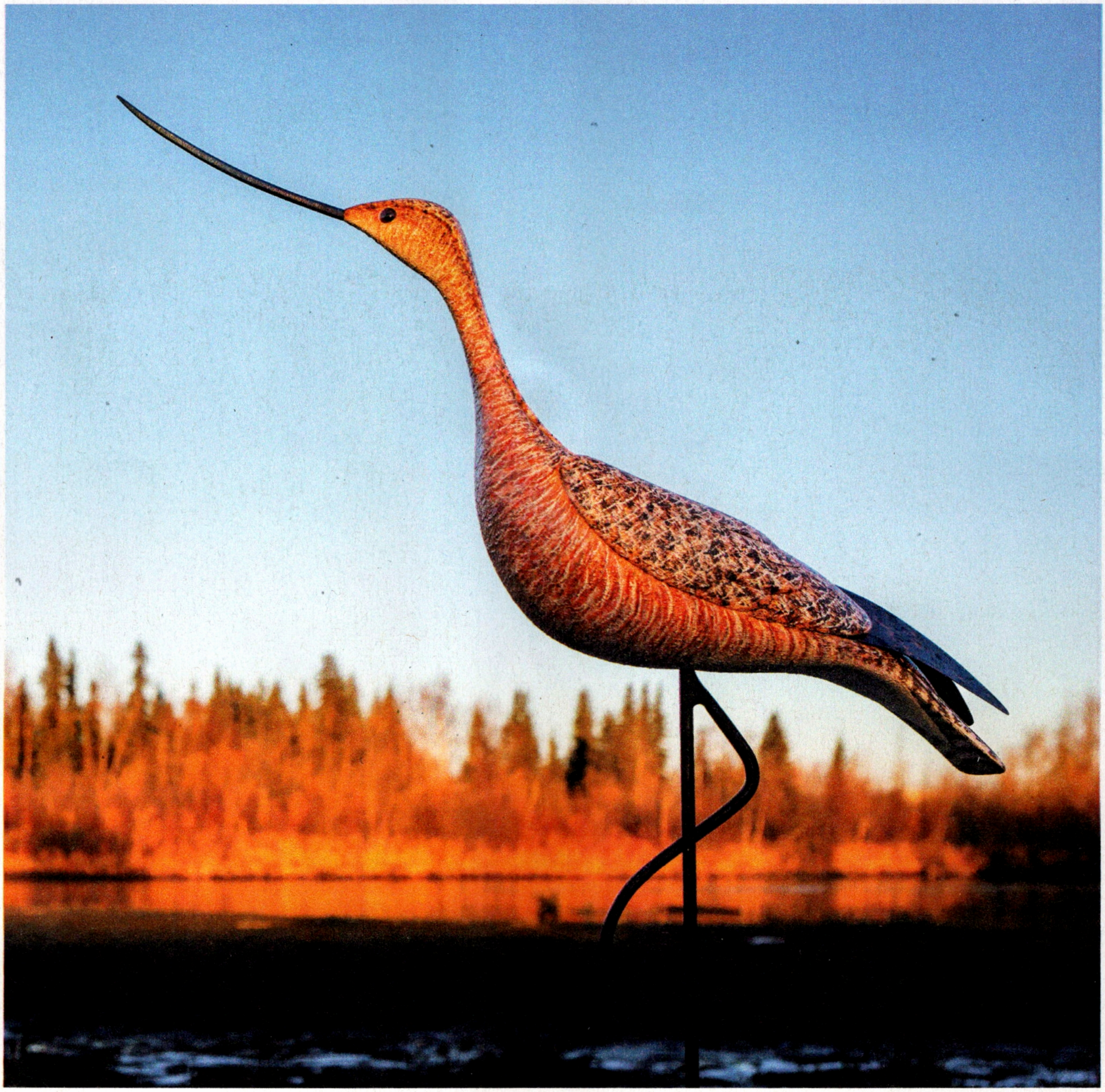

PHOTO: JR ANCHETA

See other artwork from The Aviary series at **audubon.org/the-aviary**.

BY THE TIME DAVID PERSONIUS WAS GROWING UP IN THE 1950S, CARVED WOODEN BIRD DECOYS were largely a thing of the past—collector's items for folk art aficionados like his dad. Personius is part of the small cadre of modern artists keeping the tradition alive. Here, he replicates the Bar-tailed Godwit, a shorebird that breeds in the Arctic, west of his home in Fairbanks, Alaska. First, he traced an outline onto a couple of hunks of wood, sawed off the excess, and carved the detailed shape with a knife. Then he painted acrylic dots to create the illusion of feathers. Glass eyes, copper wing tips, and custom-wrought iron bill and legs add depth and realism. Personius speaks with infectious enthusiasm about the real godwits, which "get absolutely, grotesquely huge" to fuel their nonstop 6,000-mile flight to New Zealand each fall. As with all migrants, they're vulnerable to disturbances on their breeding and overwintering grounds—and everywhere in between. Although decoys were originally used for hunting, Personius hopes his modern version can help spur action to protect avian life: "I've been carving and talking about the feats of the Bar-tailed Godwit as a way to make people more aware of the plight of migratory birds." *—Jessica McKenzie*

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